



Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

A wide-angle photograph of a sunset over a dark field. The sky is filled with vibrant orange and red clouds, with the sun low on the horizon. In the distance, there are silhouettes of trees and utility poles.

# Weather/Climate Issues for Ag 2019 and Beyond

A close-up, slightly blurred photograph of a cornfield. The green leaves of the corn plants are the primary focus, creating a textured background.

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# Topics

- A brief Background of USDA Climate Hubs
  - The need, mission
  - More on the Midwest Climate Hub
- Tools
- Long Term Crop Impacts
- Monitoring
- Outlooks
- Resources of the USDA Midwest Climate Hub
  - Website
  - For more Information



# Topics

- A brief Background of USDA Climate Hubs

- The ne
- More c

- Current

- Crop In

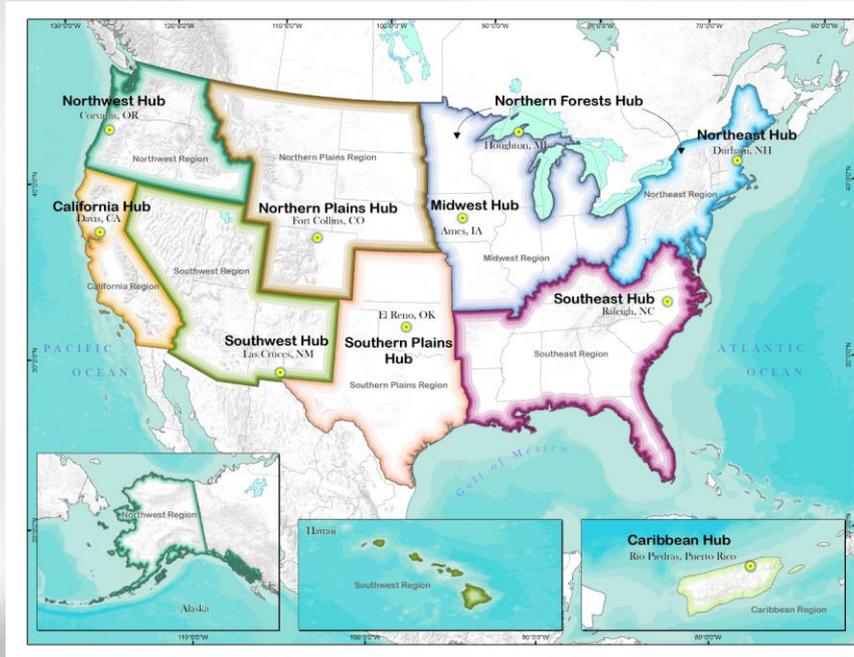
- Outloo

- Resour

- Webs
- For m

The screenshot shows the USDA Climate Hubs website interface. At the top, there is a dark blue header with the USDA logo and 'Climate Hubs U.S. DEPARTMENT OF AGRICULTURE'. Navigation links include 'About Us', 'Original Site', and 'Contact Us'. Below the header is a light grey navigation bar with 'REGIONAL HUBS', 'ALL TOPICS', 'ALL CLIMATE IMPACTS', 'ALL ACTIONS & RESOURCES', and a search box. A dark grey sub-navigation bar contains 'Midwest Climate Hub', 'About', 'Topics', 'Climate Impacts', 'Actions & Resources', and 'Climate Outlooks', which is circled in red. A green notification bar states 'Hubs General Content *Climate Outlooks* has been updated.' Below this are buttons for 'View', 'Edit', 'Delete', and 'Revisions'. The main content area is titled 'Climate Outlooks' and features a thumbnail for 'A MIDWEST AG FOCUS CLIMATE OUTLOOK' with images of a tractor, a field, and a plant. The title 'Midwest Ag Focus Outlook' is circled in red. A link for '\*\*Northeast Iowa Research Farm Growing Season Outlook June 2019' is also circled in red. A paragraph at the bottom explains that the outlooks are produced monthly and provides a link to find the most current outlook and an email subscription link.

# Intro to Climate Hub Work



## Assessments and Syntheses

\*delivering relevant information\*

## Outreach and Education

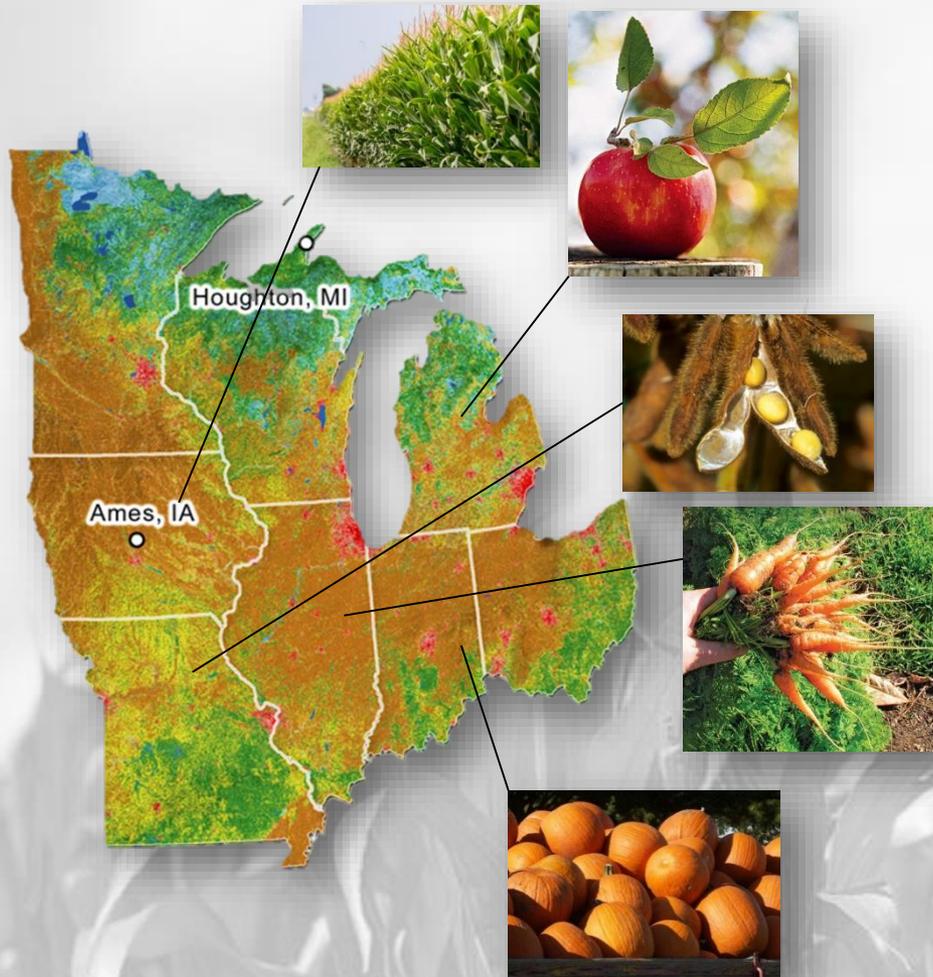
\*enabling climate-informed decisions\*

## Technical Support

\*facilitating engagement, discovery and exchange\*



# Here in the Midwest...



## Our Goal

To provide information to help producers cope with climate change through **linkages of research, education and partnerships** in a region that represents one of the **most intense areas of agricultural production** in the world.

# MCH Thematic Areas

## Assessments and Syntheses

\*delivering relevant information\*



United States Department of Agriculture  
National Institute of Food and Agriculture



AMERICAN  
**FRUIT GROWER**



U.S. Global Change Research Program  
**National Climate  
Assessment**



AMERICAN  
**Vegetable  
GROWER.**

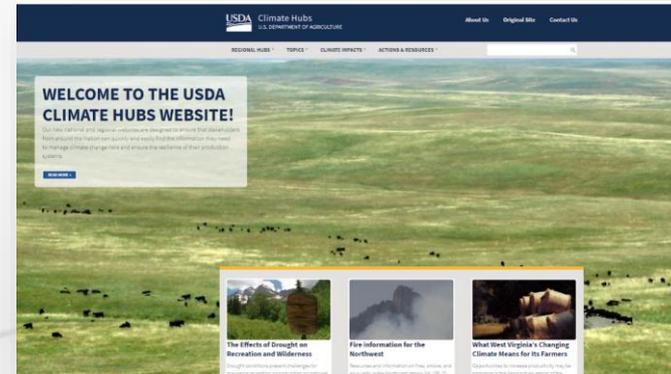
# MCH Thematic Areas

## Outreach and Education

\*enabling climate-informed decisions\*

## MAC-T

## Midwest Agriculture and Climate Team





Would have been a pretty good growing season except.....

# **A LITTLE CLIMATE BACKGROUND**

## Statewide Maximum Temperature Ranks

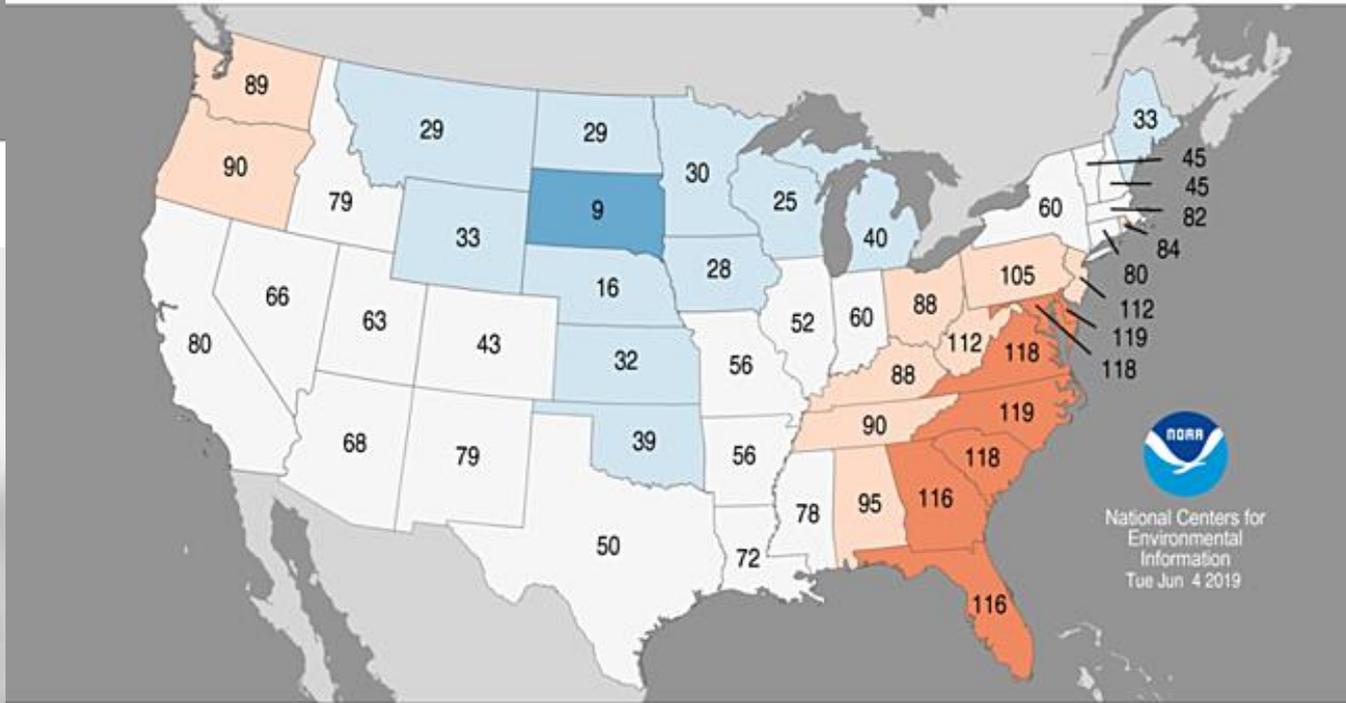
May 2019  
Period: 1895-2019



# Spring Temperature

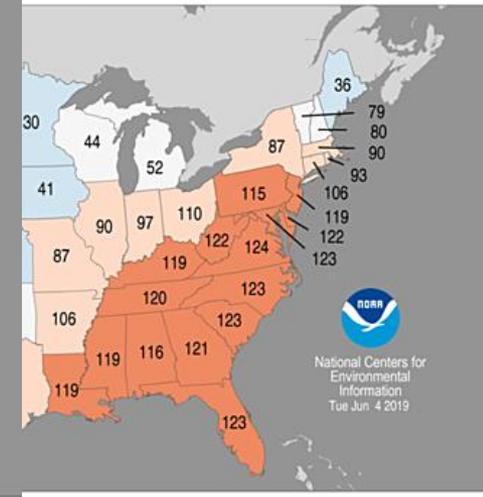
## Statewide Average Temperature Ranks

March-May 2019  
Period: 1895-2019



## Temperature Ranks

May 2019  
Period: 1895-2019



Record Coldest  
(1)

Much Below Average

Below Average

Near Average

Above Average

Much Above Average

Record Warmest  
(125)

Near Average

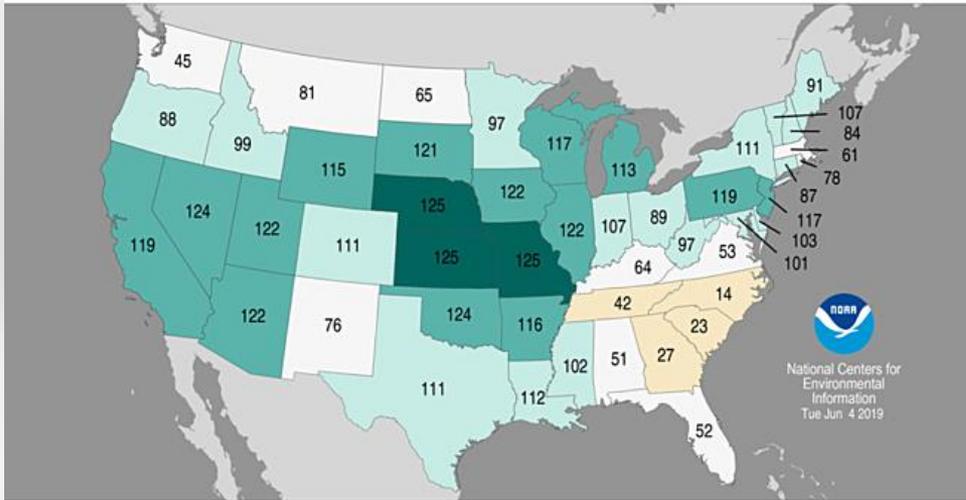
Above Average

Much Above Average

Record Warmest  
(125)

## Statewide Precipitation Ranks

May 2019  
Period: 1895–2019

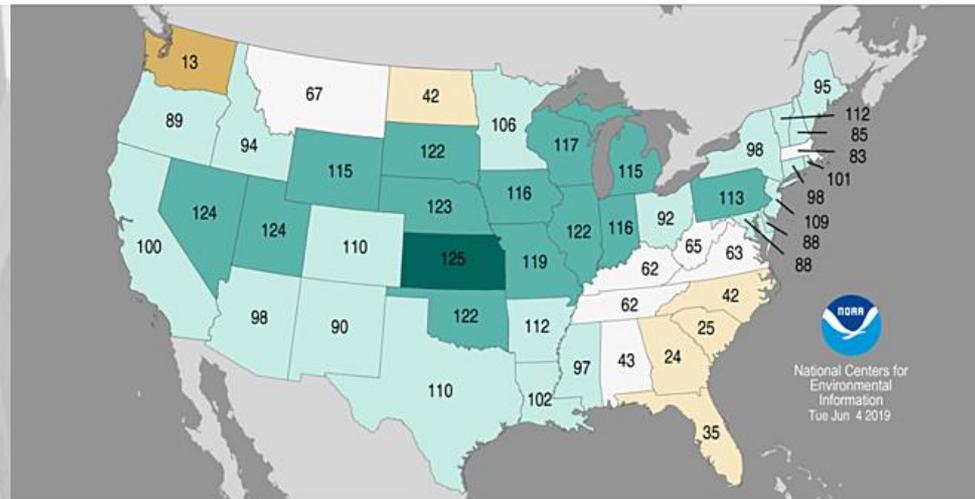


# May/Spring Precipitation

- May and spring precipitation well above average through middle US
- Top 10 and wettest all time for a few states at these time scales

## Statewide Precipitation Ranks

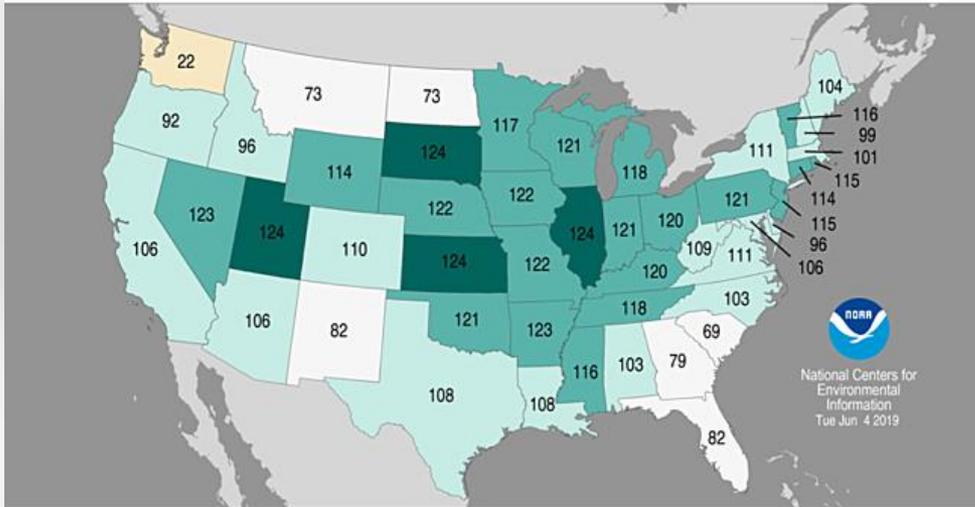
March–May 2019  
Period: 1895–2019



## Statewide Precipitation Ranks

December 2018–May 2019

Period: 1895–2019

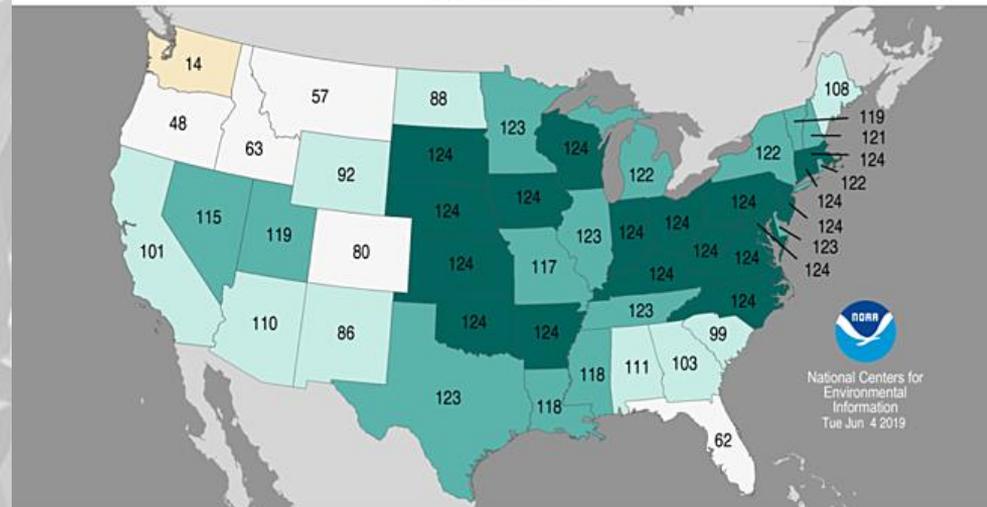


# 6/12 Month Precipitation

## Statewide Precipitation Ranks

June 2018–May 2019

Period: 1895–2019



- Extended period of wetness back to a year.
- Top 10/record wettest in states back to a year.
- Wetness problems are long term issues.
- Iowa wettest June-May period on record (124 years)

<https://www.ncdc.noaa.gov/temp-and-precip/us-maps/>

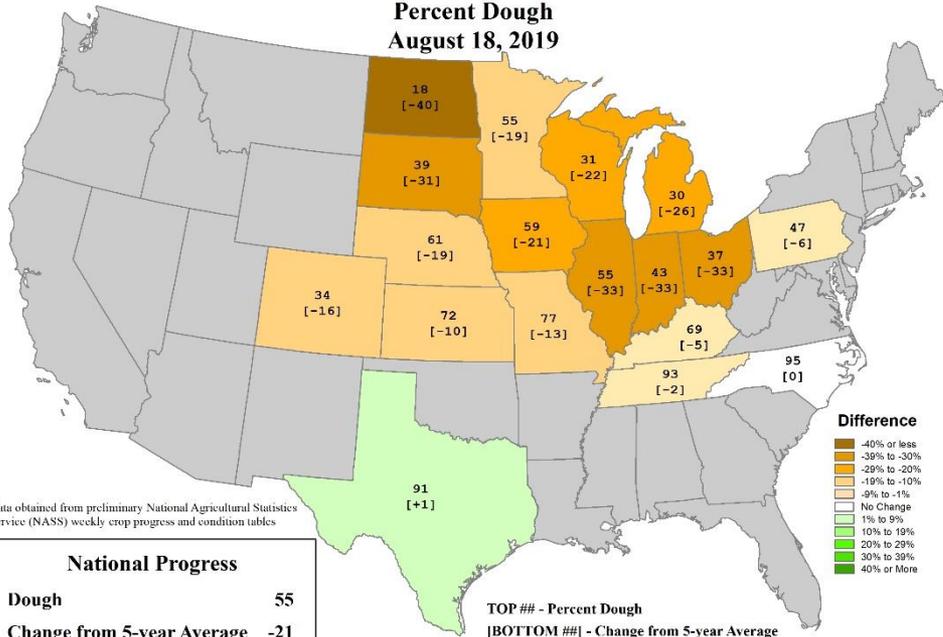


Corn and Bean Status

# **CROP CONDITIONS**

# U.S. Corn Progress

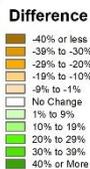
Percent Dough  
August 18, 2019



Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

National Progress	
Dough	55
Change from 5-year Average	-21

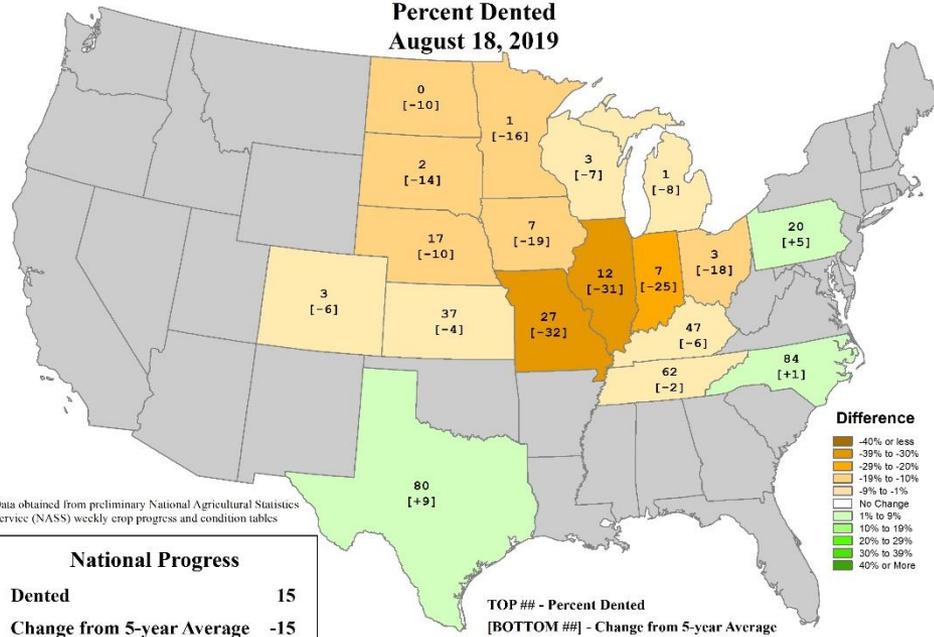
TOP ## - Percent Dough  
[BOTTOM ##] - Change from 5-year Average



# USDA NASS Crop Progress (through August 18)

## U.S. Corn Progress

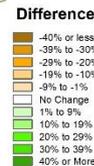
Percent Dented  
August 18, 2019



Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

National Progress	
Dented	15
Change from 5-year Average	-15

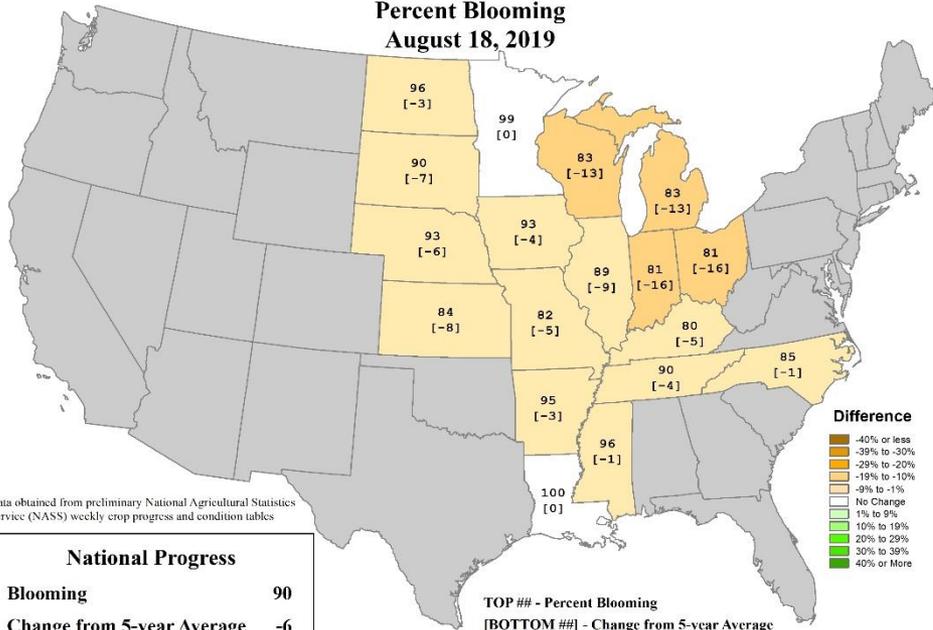
TOP ## - Percent Dented  
[BOTTOM ##] - Change from 5-year Average



Crop progress (corn dough and dent) nationally through August 18 (dough 55% -21%; dent 15% -15%). Iowa (dough 59% -21%; dent 7% -19%).

# U.S. Soybeans Progress

Percent Blooming  
August 18, 2019



Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

## National Progress

**Blooming** 90  
**Change from 5-year Average** -6

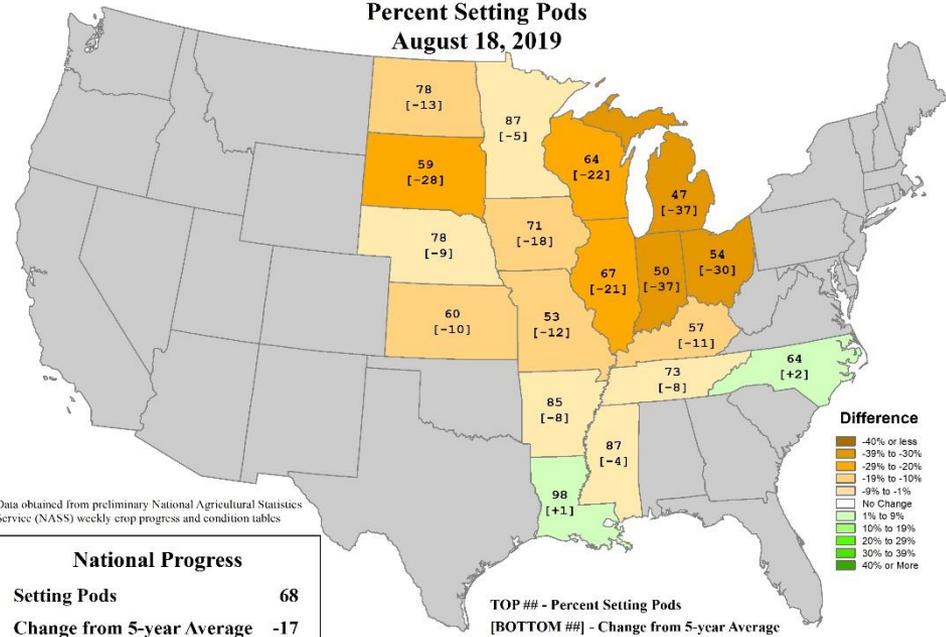
TOP ## - Percent Blooming  
[BOTTOM ##] - Change from 5-year Average



# USDA NASS Crop Progress (through August 18)

## U.S. Soybeans Progress

Percent Setting Pods  
August 18, 2019

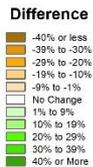


Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

## National Progress

**Setting Pods** 68  
**Change from 5-year Average** -17

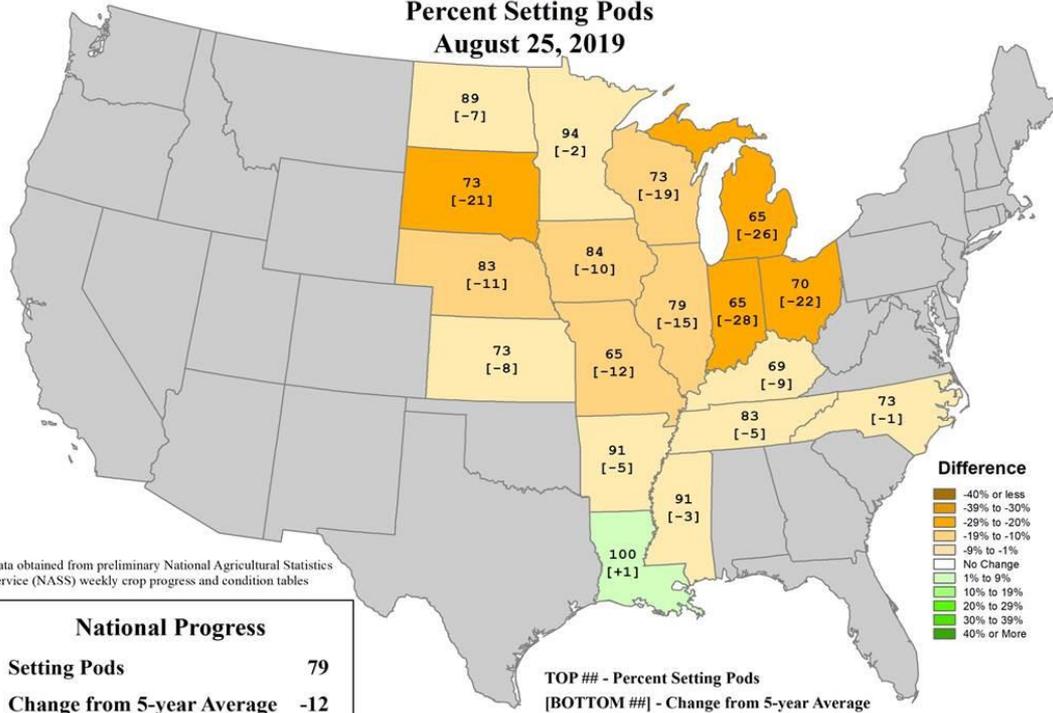
TOP ## - Percent Setting Pods  
[BOTTOM ##] - Change from 5-year Average



Soybean progress (blooming and setting pods) nationally through August 18 (blooming 90% -6%; pods 68% -17%). Iowa (blooming 93% -4%; pods 71% -18%).

# U.S. Soybeans Progress

Percent Setting Pods  
August 25, 2019



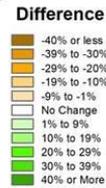
# USDA NASS Crop Progress (through August 25)

Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

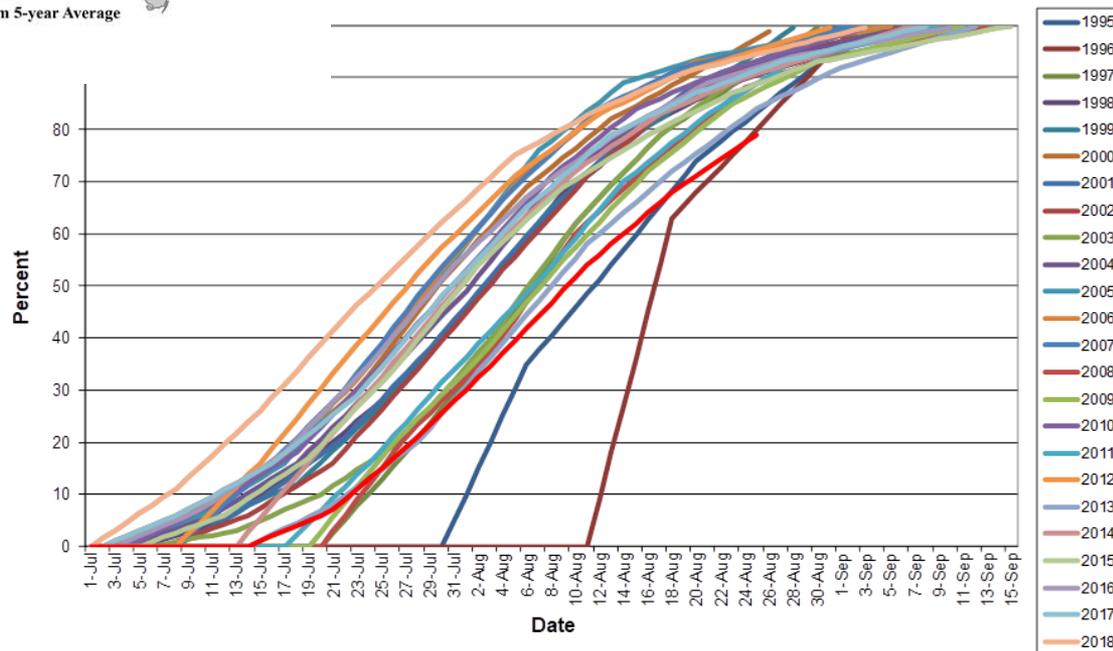
## National Progress

Setting Pods 79  
Change from 5-year Average -12

TOP ## - Percent Setting Pods  
[BOTTOM ###] - Change from 5-year Average



## U.S. SOYBEANS: Percent Setting pods

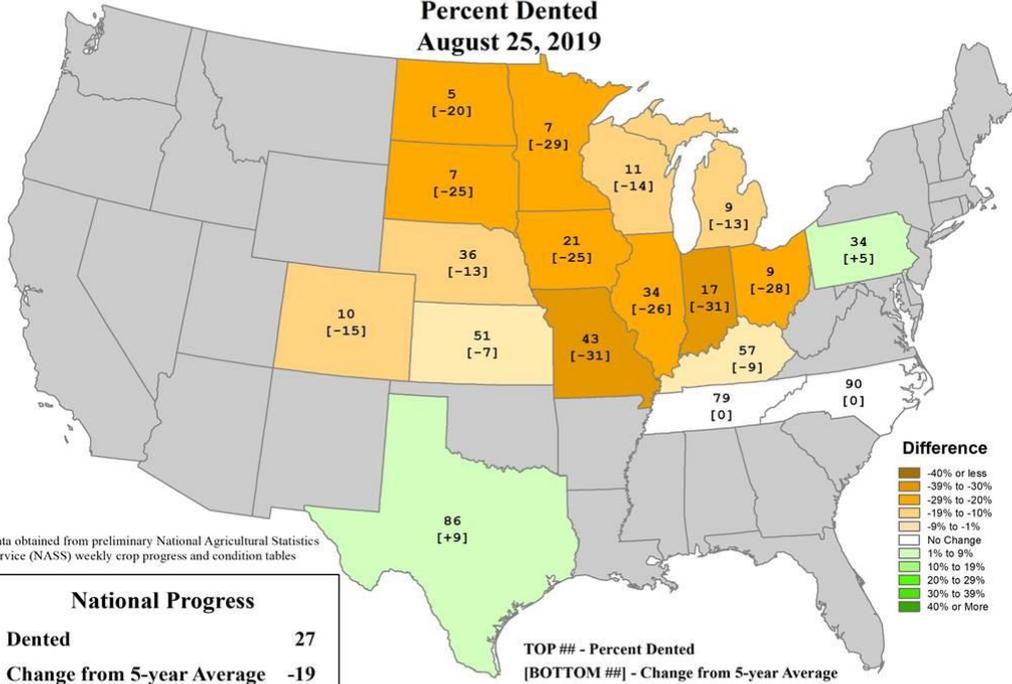


Soybean progress (setting pods) nationally through August 25 (pods 79% - 12%). Iowa (pods 84% - 10%).

Lowest pod set on record as of Aug. 25

# U.S. Corn Progress

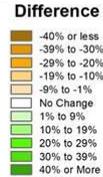
Percent Dented  
August 25, 2019



Data obtained from preliminary National Agricultural Statistics Service (NASS) weekly crop progress and condition tables

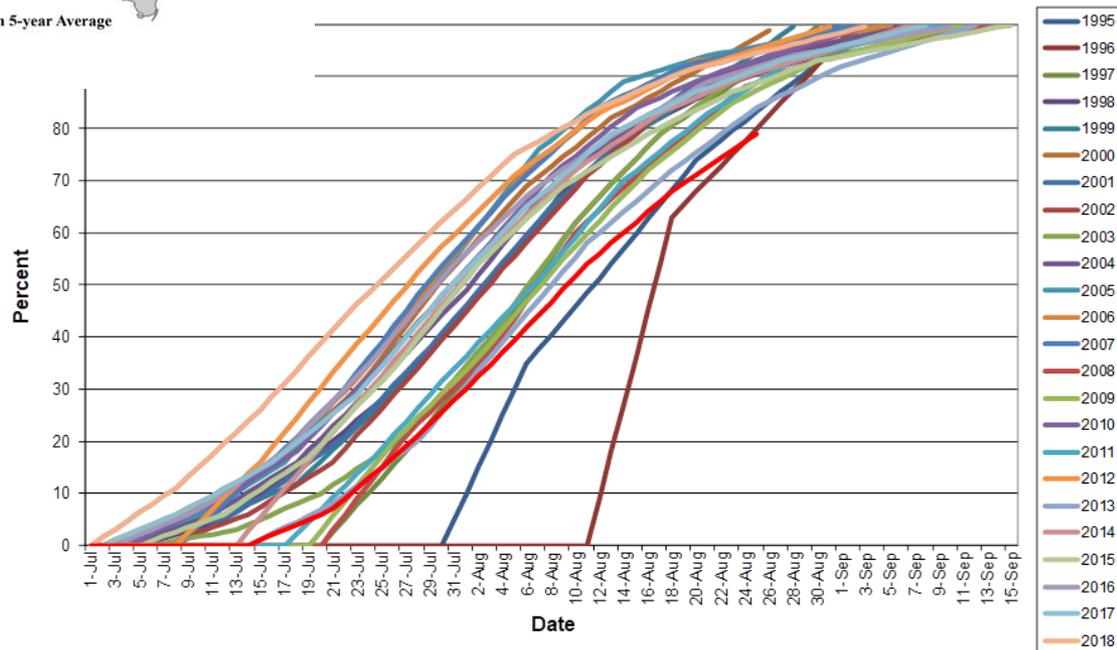
National Progress	
Dented	27
Change from 5-year Average	-19

TOP ## - Percent Dented  
[BOTTOM ##] - Change from 5-year Average



# USDA NASS Crop Progress (through August 25)

## U.S. SOYBEANS: Percent Setting pods



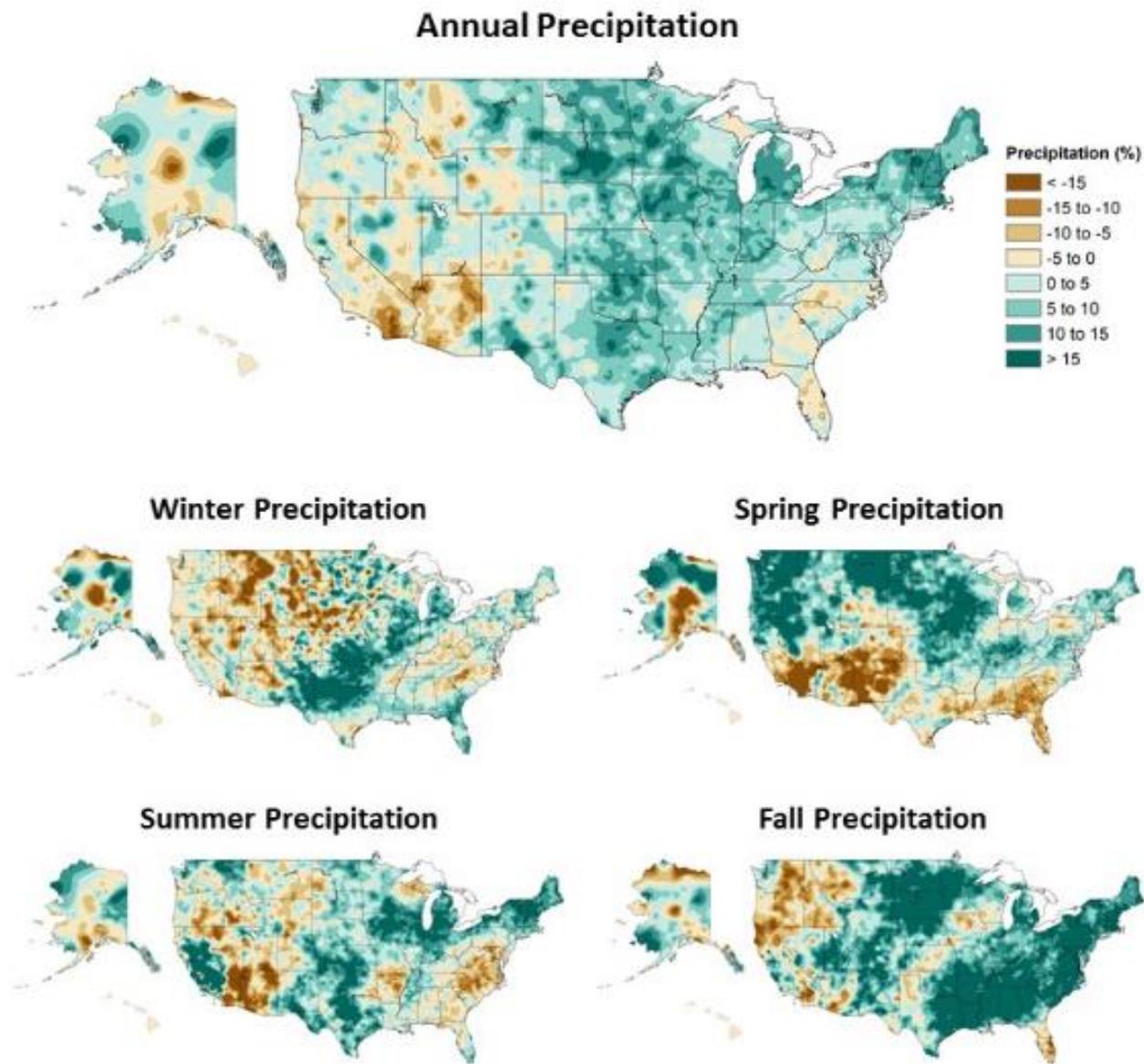
Corn progress (dented) nationally through August 25 (27% -19%). Iowa (21% -25%).

6<sup>th</sup> lowest dented on record as of Aug. 25



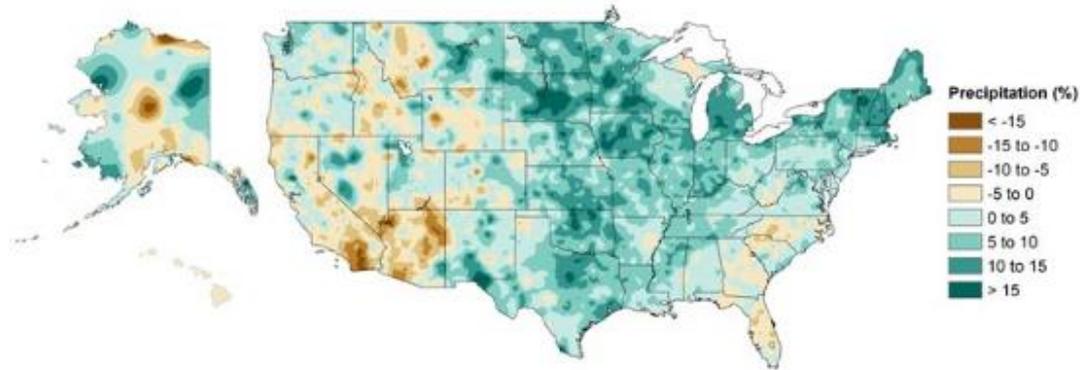
Using data to make decisions

# **LONG TERM IMPACTS - AGRICULTURE**

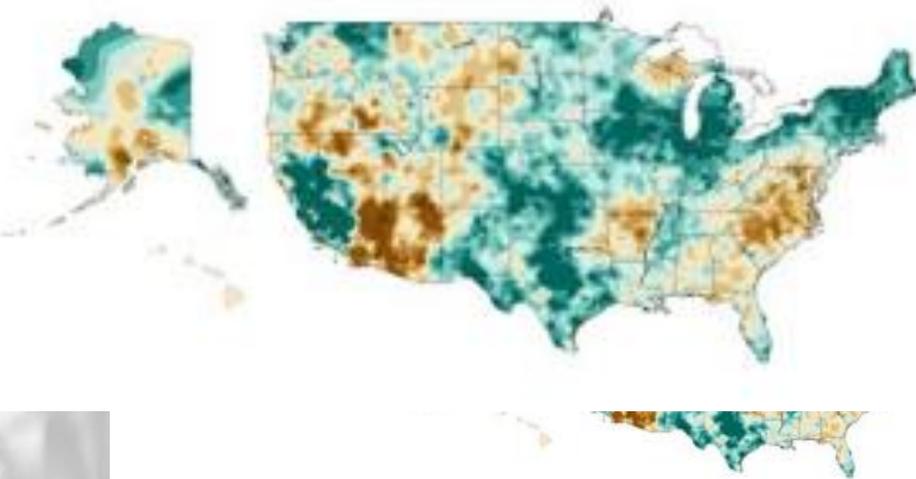


**Figure 7.1:** Annual and seasonal changes in precipitation over the United States. Changes are the average for present-day (1986–2015) minus the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawai'i) divided by the average for the first half of the century. (Figure source: [top panel] adapted from Peterson et al. 2013,<sup>78</sup> © American Meteorological Society. Used with permission; [bottom four panels] NOAA NCEI, data source: nCLIMDiv].

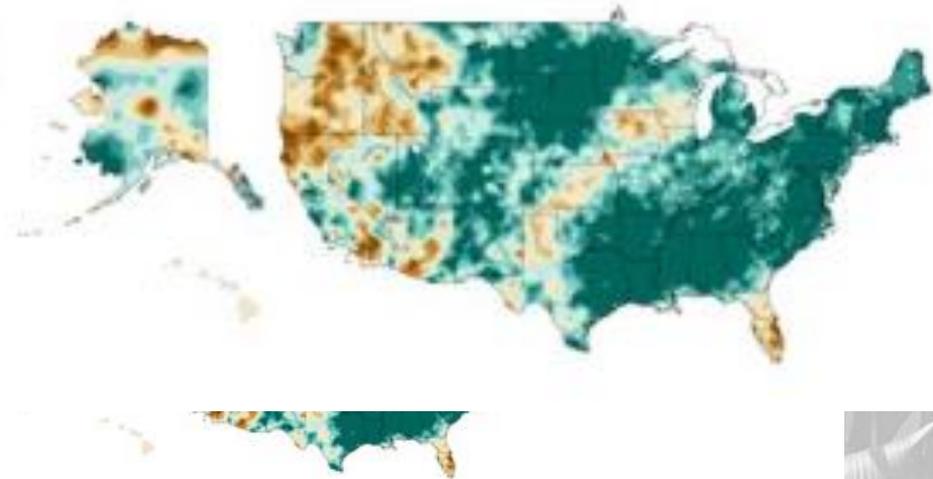
### Annual Precipitation



### Summer Precipitation

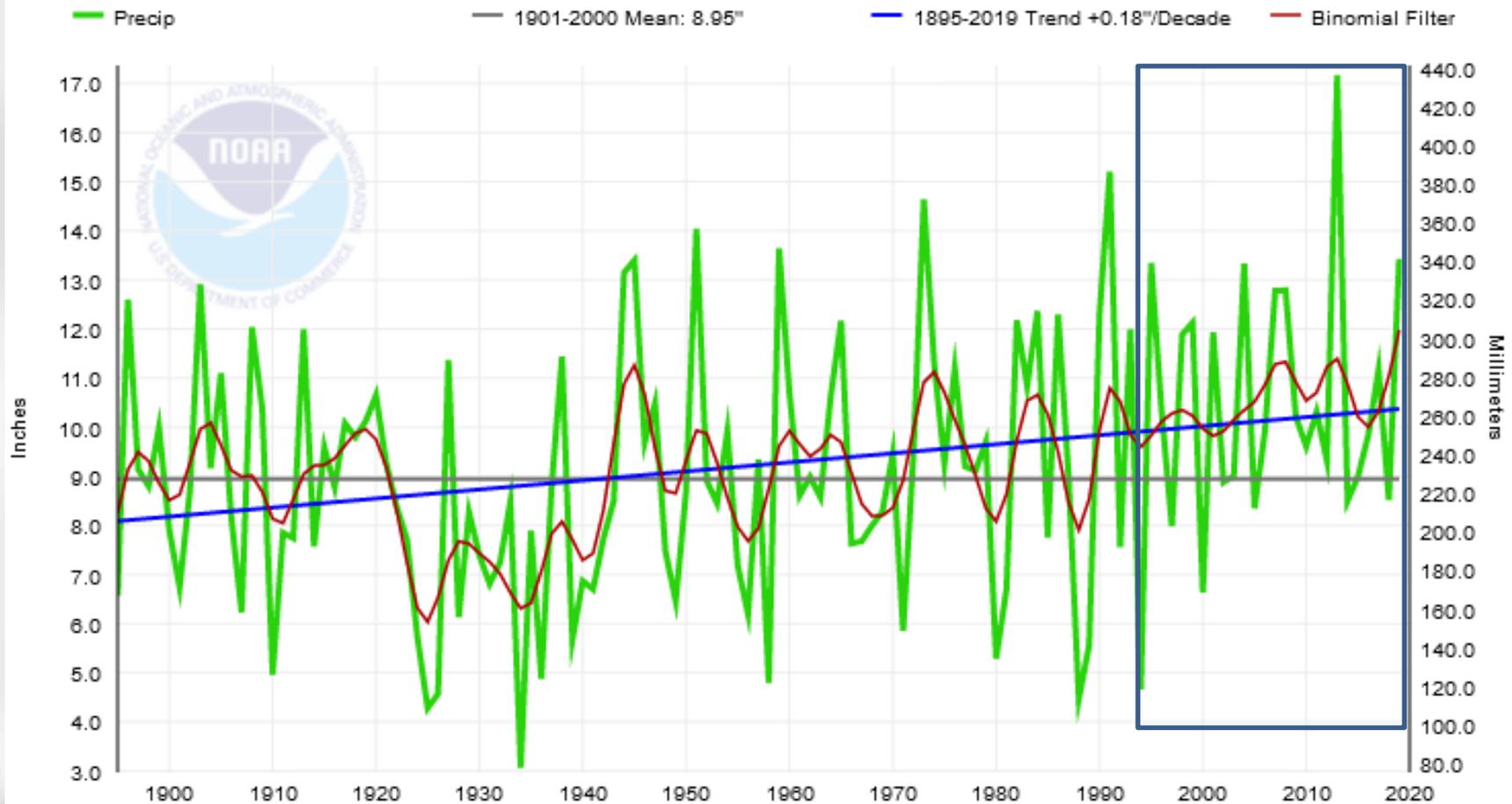


### Fall Precipitation



**Figure 7.1:** Annual and seasonal changes in precipitation over the United States. Changes are the average for present-day (1986–2015) minus the average for the first half of the last century (1901–1960 for the contiguous United States, 1925–1960 for Alaska and Hawai'i) divided by the average for the first half of the century. (Figure source: [top adapted from Peterson et al. 2013,<sup>78</sup> © American Meteorological Society. Used with permission; [bottom four NOAA NCEI, data source: nCLIMDiv].

# Iowa, Precipitation, March-May

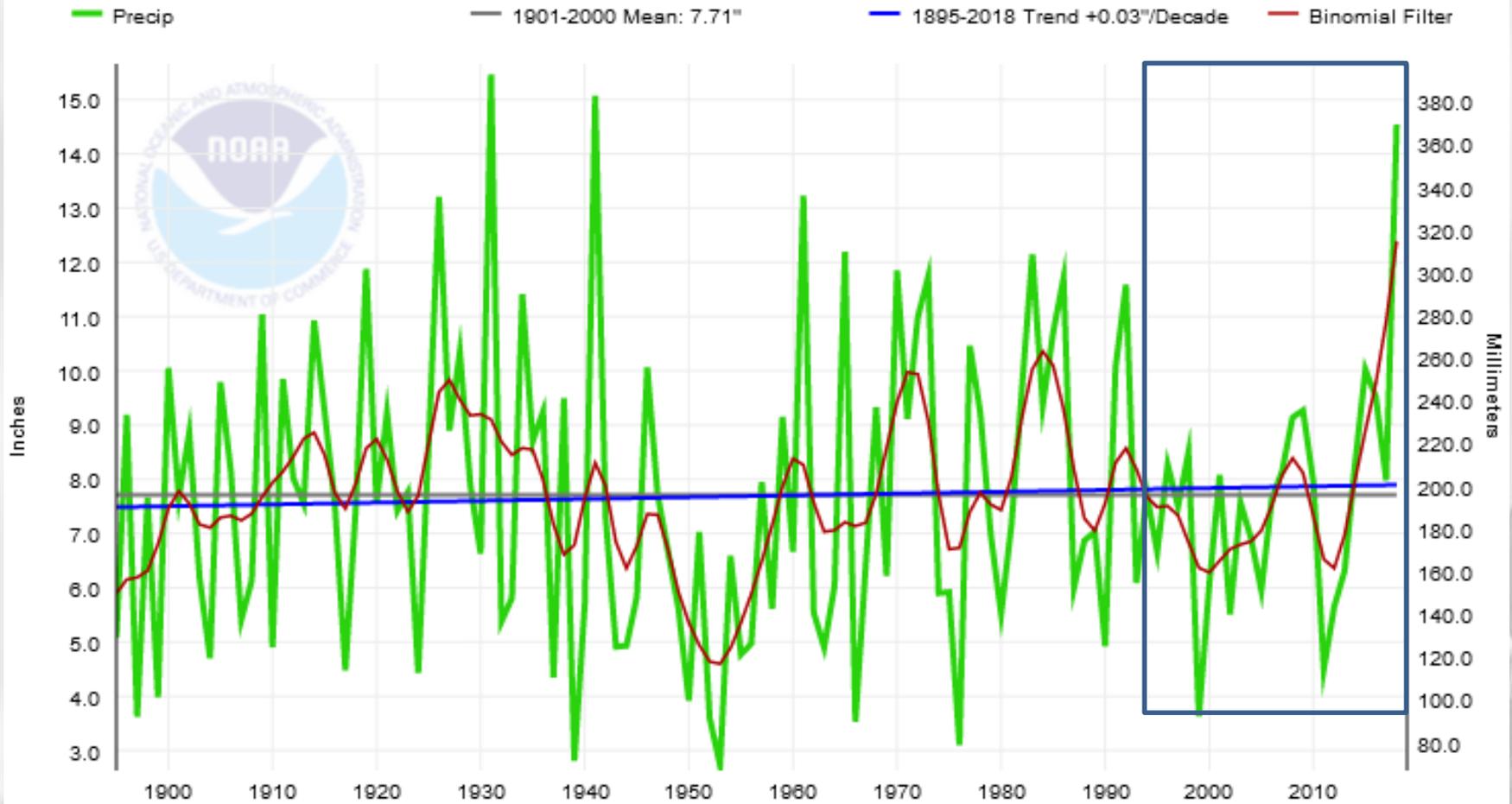


Only 6 of last 25 years below long term average.

<https://www.ncdc.noaa.gov/cag/divisional/time-series>



# Iowa, Precipitation, September-November



Only 5 of last 25 years below long term average.

<https://www.ncdc.noaa.gov/cag/divisional/time-series>

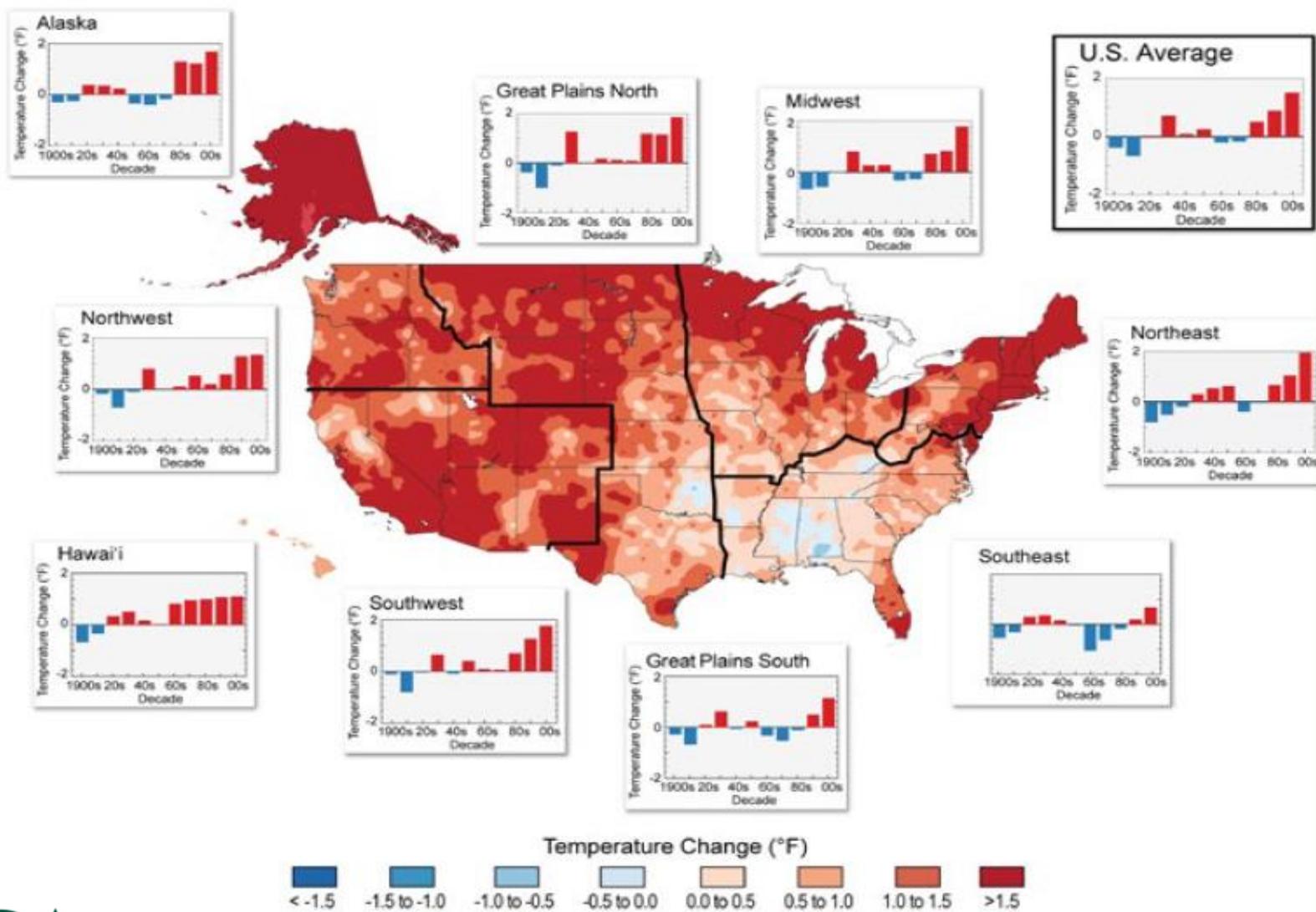


# Issues from Precip Changes

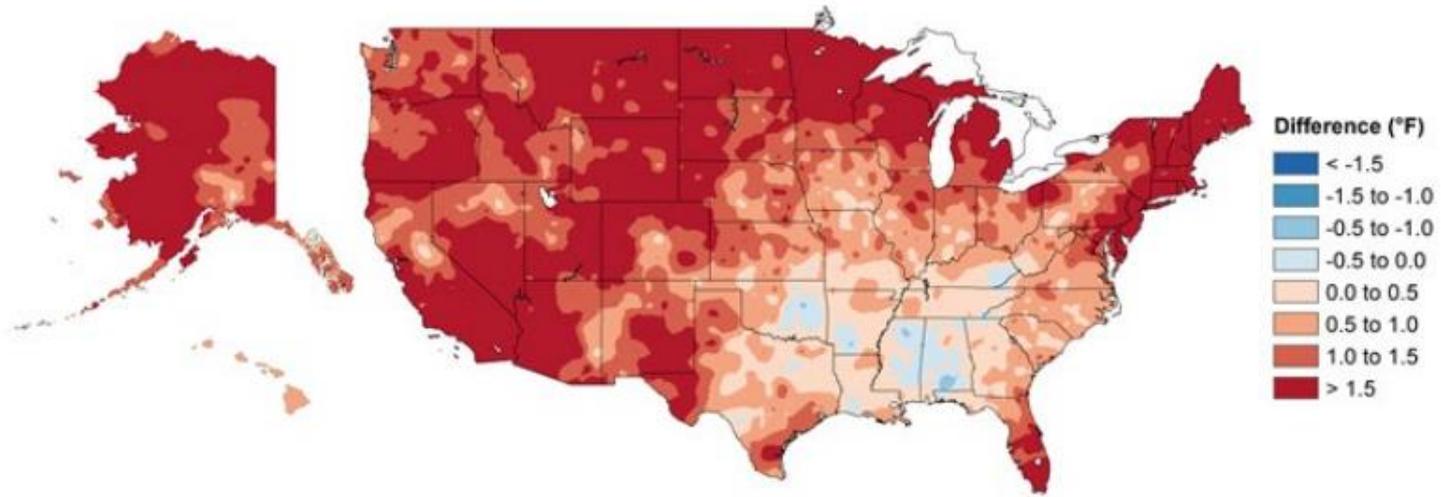
- Variable across the corn belt
- Increasing precip totals (especially off-season)
- More soil/nutrient loss potential
- Soil loss
  - Reducing tillage
  - Cover crops
- Nutrient loss
  - 4Rs
- Planting/harvesting issues
- Increased need for drainage



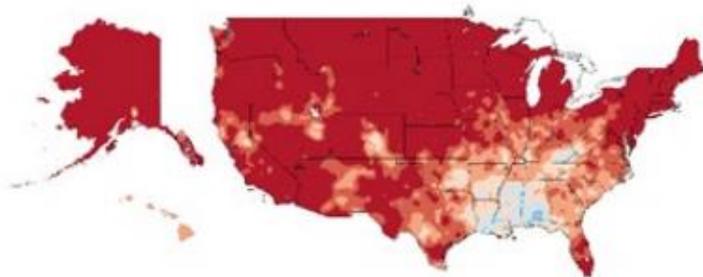
# Observed U.S. Temperature Change



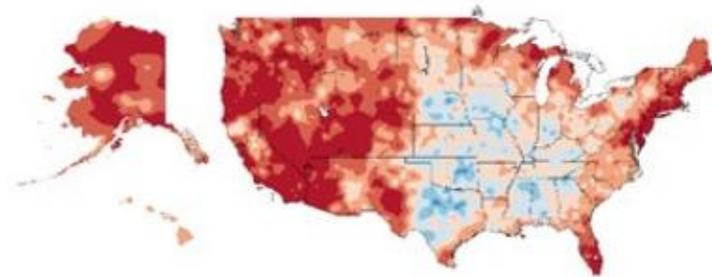
## Annual Temperature



## Winter Temperature

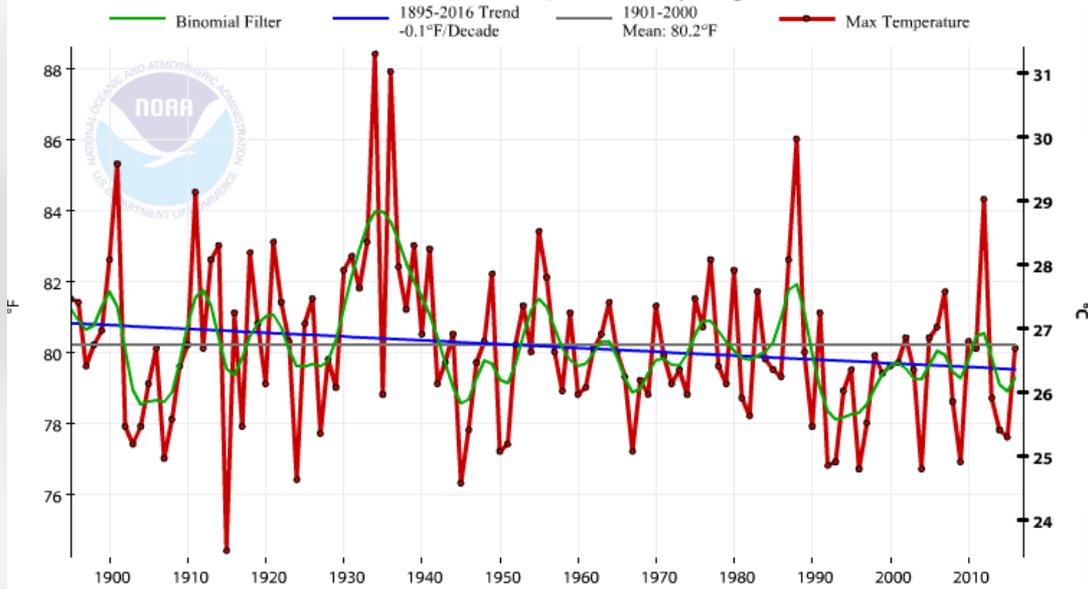


## Summer Temperature

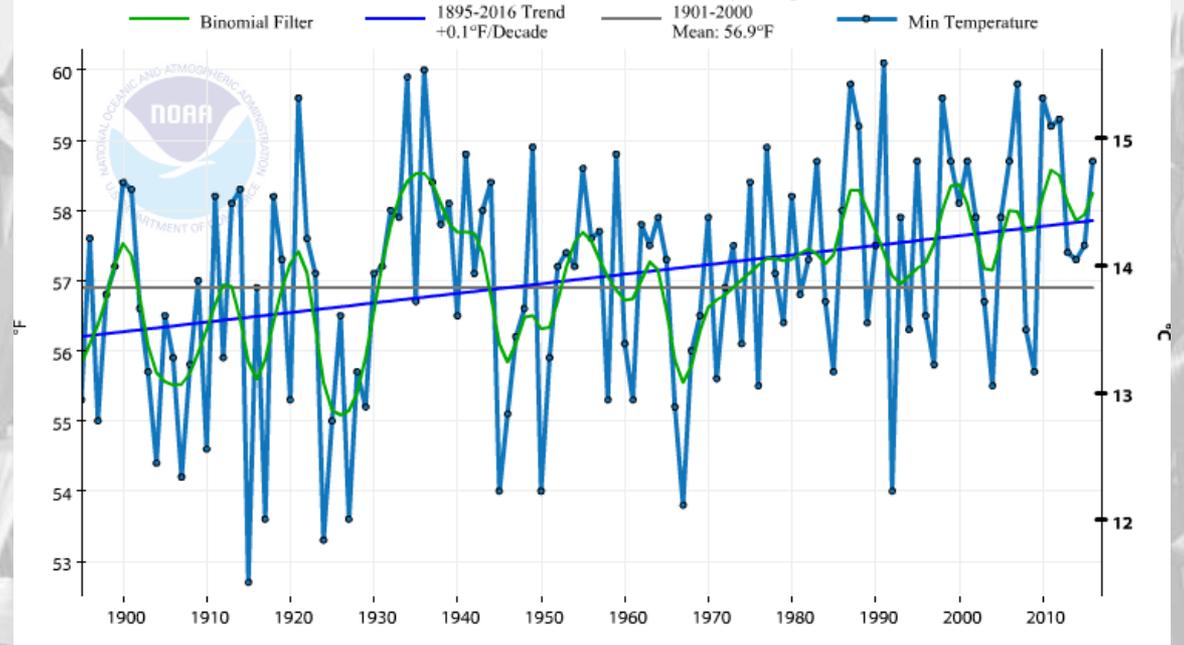


**Figure 6.1.** Observed changes in annual, winter, and summer temperature (°F). Changes are the difference between range for present-day (1986–2016) and the average for the first half of the last century (1901–1960 for the con-United States, 1925–1960 for Alaska and Hawai'i). Estimates are derived from the nClimDiv dataset.<sup>1,2</sup> (Figure NOAA/NCEI).

### Iowa, Maximum Temperature, May-August

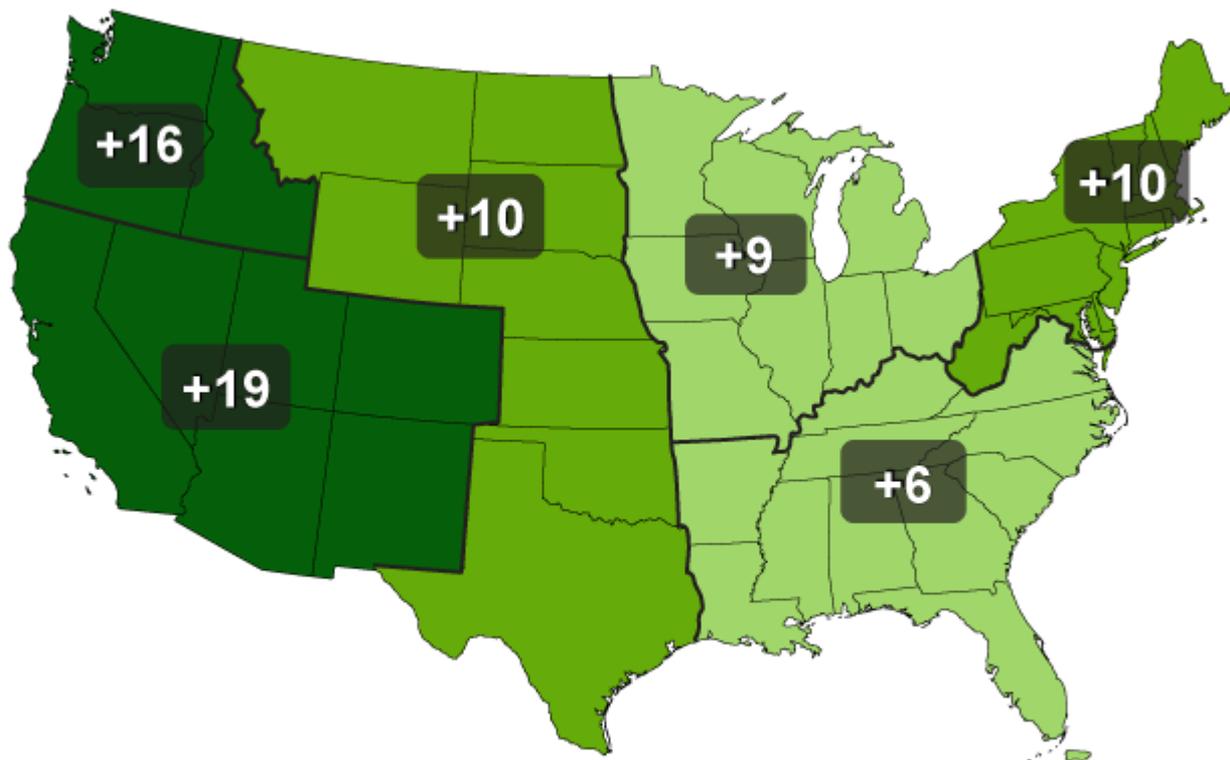


### Iowa, Minimum Temperature, May-August



[ncdc.noaa.gov/cag](http://ncdc.noaa.gov/cag)

# Observed Increase in Frost-Free Season Length



Change in Annual Number of Days



The frost-free season length, defined as the period between the last occurrence of 32°F in the spring and the first occurrence of 32°F in the fall, has increased in each U.S. region during 1991-2012 relative to 1901-1960.

Increases in frost-free season length correspond to similar increases in growing season length. (Figure source: NOAA NCDC / CICS-NC).

<http://nca2014.globalchange.gov/>



Using data to make decisions

# TOOLS



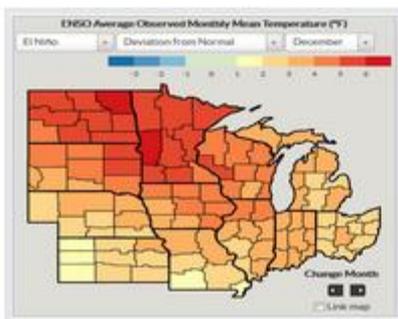
# Decision Support Tools

## U2U<sub>DST</sub> SUITE



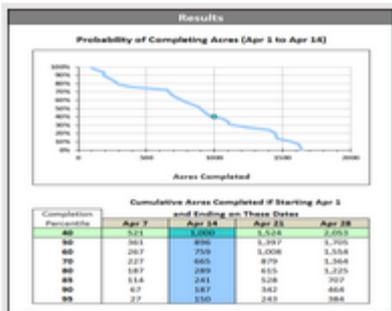
### AgClimate View<sub>DST</sub>

A convenient way to access customized historical climate and crop yield data for the U.S. Corn Belt. View graphs of monthly temperature and precipitation, plot corn and soybean yield trends, and compare climate and yields over the past 30 years.



### Climate Patterns Viewer<sub>DST</sub>

Discover how global climate patterns like the El Niño Southern Oscillation (ENSO) and Arctic Oscillation (AO) have historically affected local climate conditions and crop yields across the U.S. Corn Belt.



### Probable Fieldwork Days<sub>DST</sub>

This spreadsheet-based tool uses USDA data on Days Suitable for Fieldwork to determine the probability of completing in-field activities during a user-specified time period. This product is currently available for Illinois, Iowa, Kansas, and Missouri. (Hosted by the University of Missouri)



### Corn GDD<sub>DST</sub>

Track real-time and historical GDD accumulations, assess spring and fall frost risk, and guide decisions related to planting, harvest, and seed selection. This innovative tool integrates corn development stages with weather and climate data for location-specific decision support tailored specifically to agricultural production.



### Corn Split NDST (NEW!)

Determine the feasibility and profitability of using post-planting nitrogen application for corn production. This product combines historical data on crop growth and fieldwork conditions with economic considerations to determine best/worst /average scenarios of successfully completing nitrogen applications within a user-specified time period.

# Corn Growing Degree Days



This tool puts current conditions into a 30-year historical perspective and offers trend projections through the end of the calendar year. Growing Degree Day (GDD) projections, combined with analysis of historical analog data, can help you make decisions about:

- Climate Risks – Identify the likelihood of reaching maturity before frosts/freezes.
- Activity Planning – Consider corn hybrid estimated physiological maturity requirements, along with GDD projections when making seed purchasing and other growing season decisions.
- Marketing – Look at historical and projected GDD when considering forward pricing and crop insurance purchases.

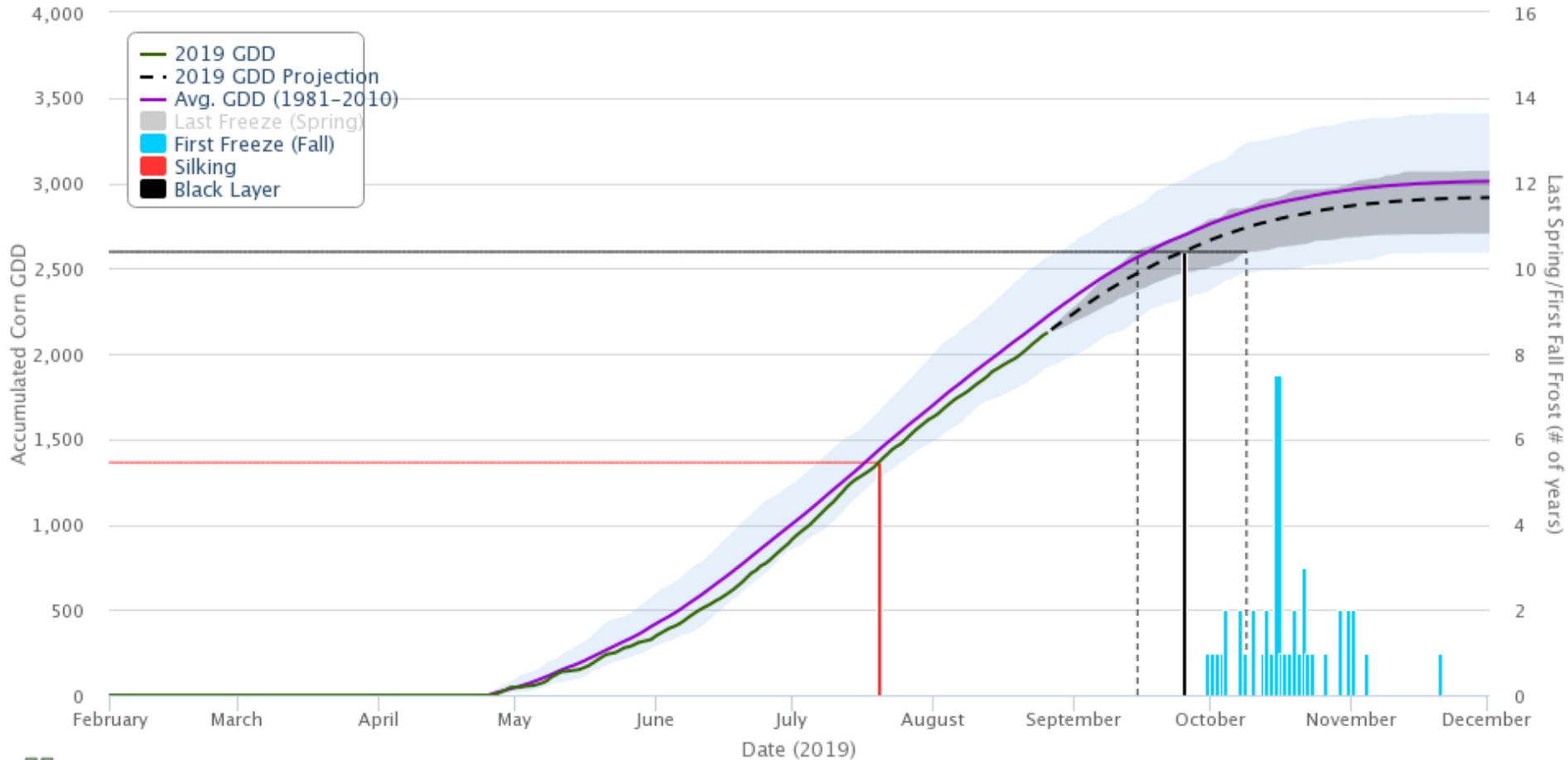


# GDD Graph



## Corn Growing Degree Day Tool

Location: 42.06, -93.43 in Story Co., IA, Start Date: April 25, Maturity Days: 108, Freeze Temp: 28°F, Variation: All Years



GDD Base 50/86 (degrees F); Created: 08/27/2019

<https://hprcc.unl.edu/gdd.php> or <https://mrcc.illinois.edu/U2U/gdd/>

# U2U Tools

- High Plains Regional Climate Center
- <https://hprcc.unl.edu/gdd.php>
- Other ag tools there
  - Soil T
  - Vegetation/freeze
  - Others

When will it happen?

# **FROST/FREEZE**

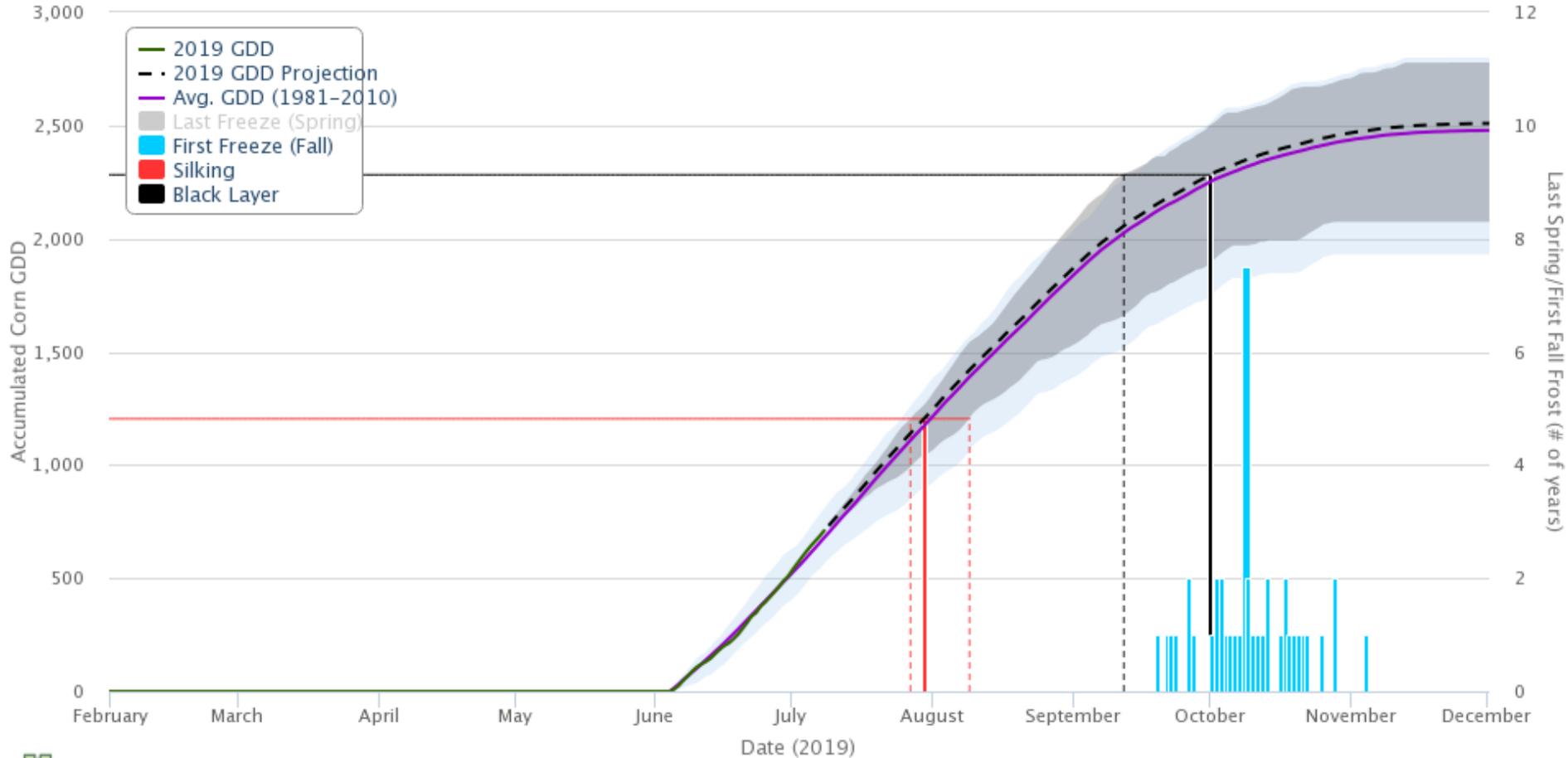


# GDD Graph



## Corn Growing Degree Day Tool

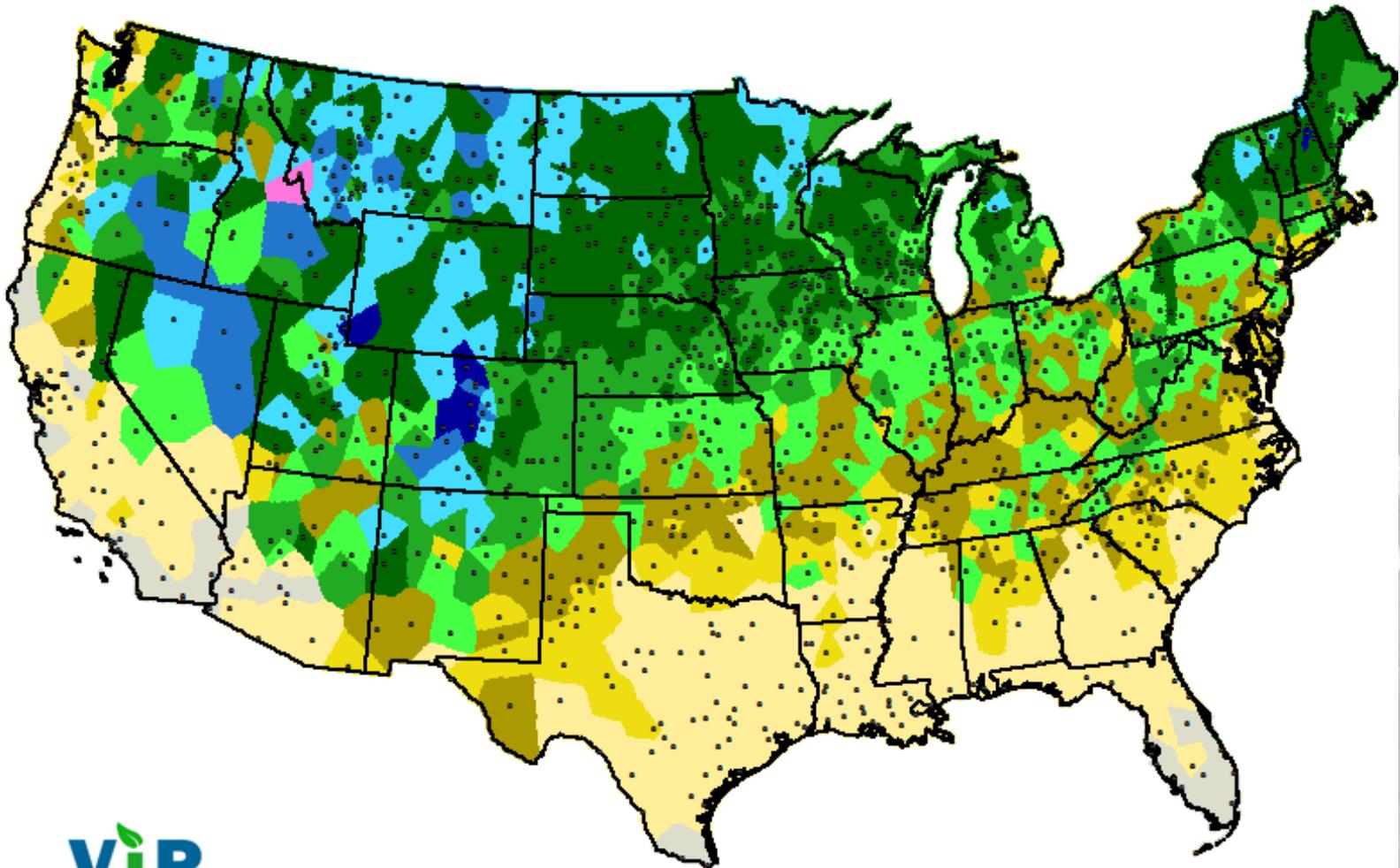
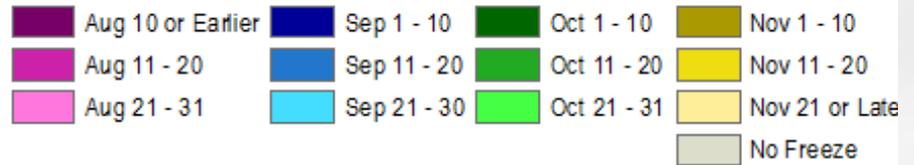
Location: 43.31, -96.91 in Turner Co., SD, Start Date: June 4, Maturity Days: 95, Freeze Temp: 28°F, Variation: All Years



GDD Base 50/86 (degrees F); Created: 07/09/2019

GDD Base 50/86 (degrees F); Created: 10/09/2015

Climatological Date of Median **First 28°F Freeze**  
For years 1980-81 to 2009-10  
Freeze year beginning July 1st  
Median defined as the 50th Percentile

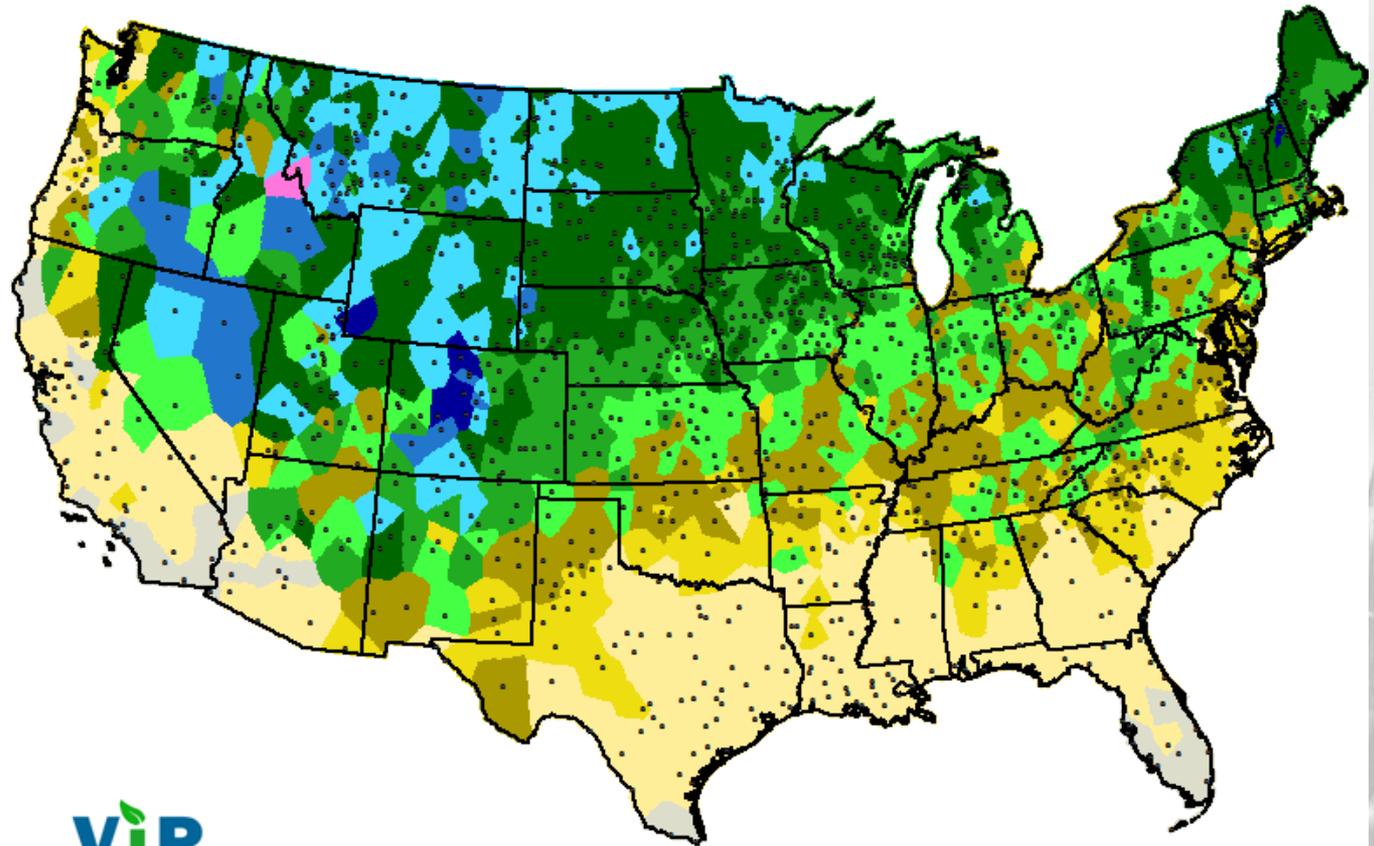
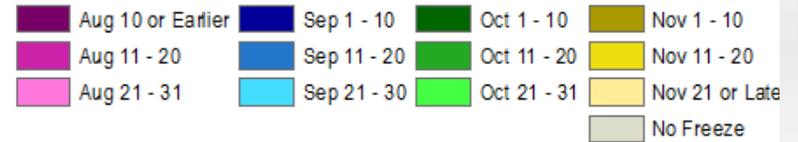


Climatological Date of Median First 28°F Freeze

For years 1980-81 to 2009-10

Freeze year beginning July 1st

Median defined as the 50th Percentile

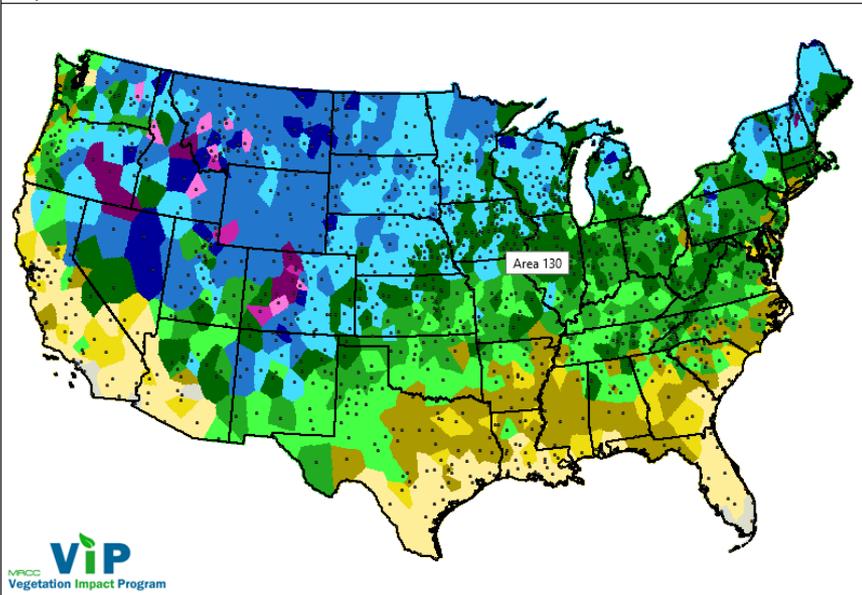


Freeze date -  
50<sup>th</sup>  
percentile

Half the time  
earlier – half  
the time later.

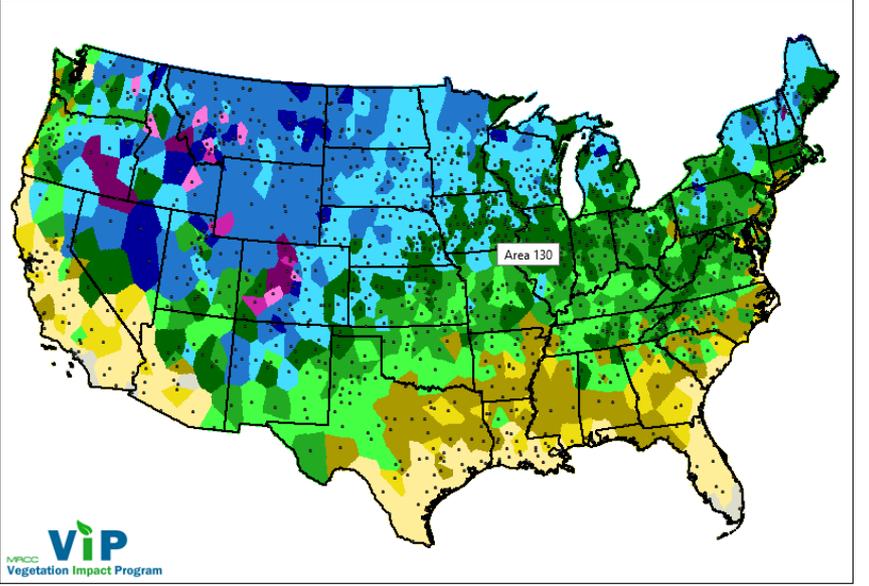
Climatological Date of Early First 28°F Freeze  
 For years 1980-81 to 2009-10  
 Freeze year beginning July 1st  
 Early defined as the 10th Percentile

Aug 10 or Earlier	Sep 1 - 10	Oct 1 - 10	Nov 1 - 10
Aug 11 - 20	Sep 11 - 20	Oct 11 - 20	Nov 11 - 20
Aug 21 - 31	Sep 21 - 30	Oct 21 - 31	Nov 21 or Later
			No Freeze



Climatological Date of Early First 28°F Freeze  
 For years 1980-81 to 2009-10  
 Freeze year beginning July 1st  
 Early defined as the 10th Percentile

Aug 10 or Earlier	Sep 1 - 10	Oct 1 - 10	Nov 1 - 10
Aug 11 - 20	Sep 11 - 20	Oct 11 - 20	Nov 11 - 20
Aug 21 - 31	Sep 21 - 30	Oct 21 - 31	Nov 21 or Later
			No Freeze



Around here

Early – very late  
 September

Late – End of October

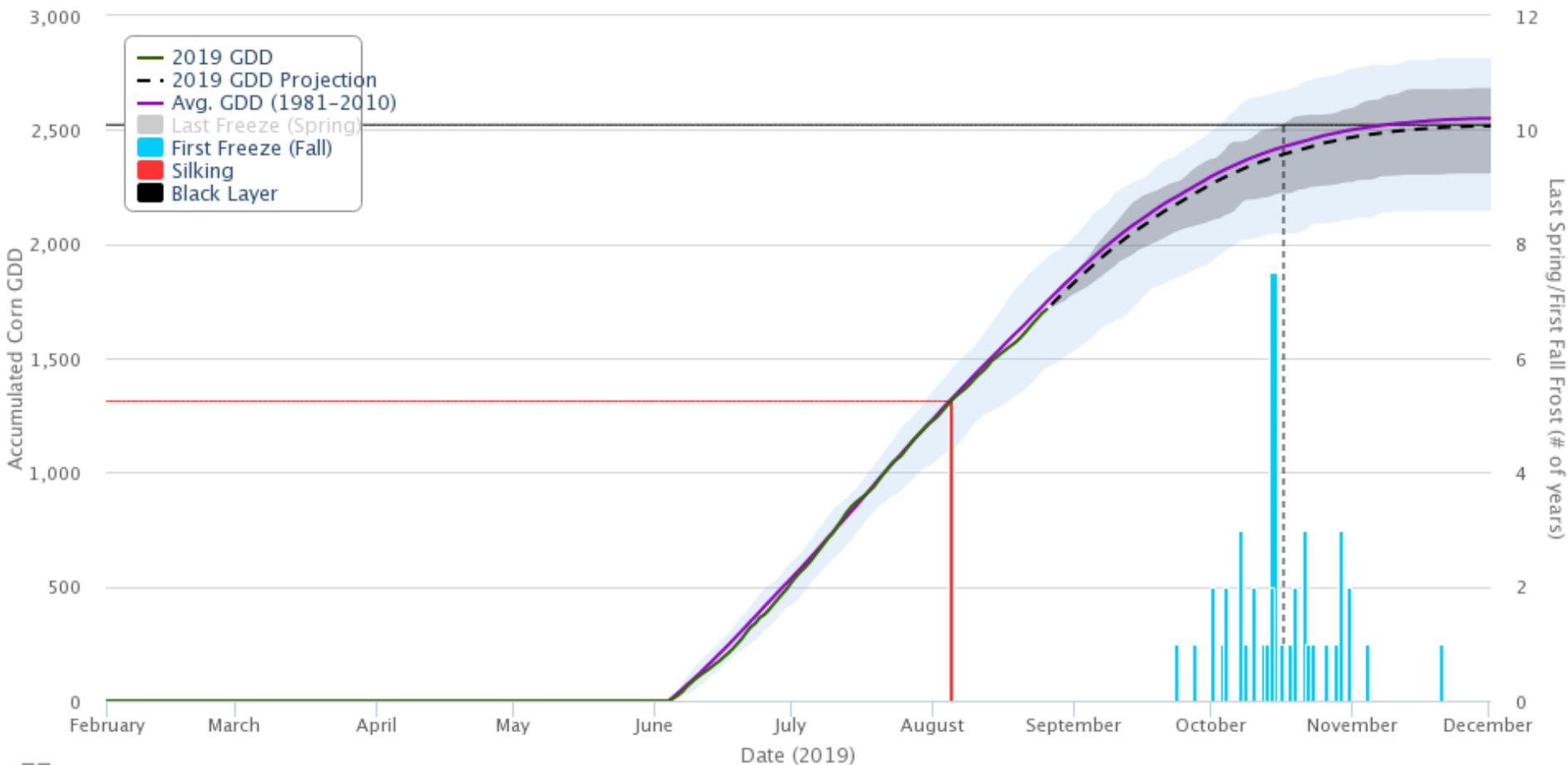
Median Agronomy Farm  
 32 F Oct. 9  
 28 F Oct. 20

Climatological Date of Early First 28°F Freeze  
 For years 1980-81 to 2009-10  
 Freeze year beginning July 1st  
 Early defined as the 10th Percentile

Aug 10 or Earlier	Sep 1 - 10	Oct 1 - 10	Nov 1 - 10
Aug 11 - 20	Sep 11 - 20	Oct 11 - 20	Nov 11 - 20
Aug 21 - 31	Sep 21 - 30	Oct 21 - 31	Nov 21 or Later
			No Freeze

## Corn Growing Degree Day Tool

Location: 42.03, -93.60 in Story Co., IA, Start Date: June 4, Maturity Days: 105, Freeze Temp: 28°F, Variation: All Years

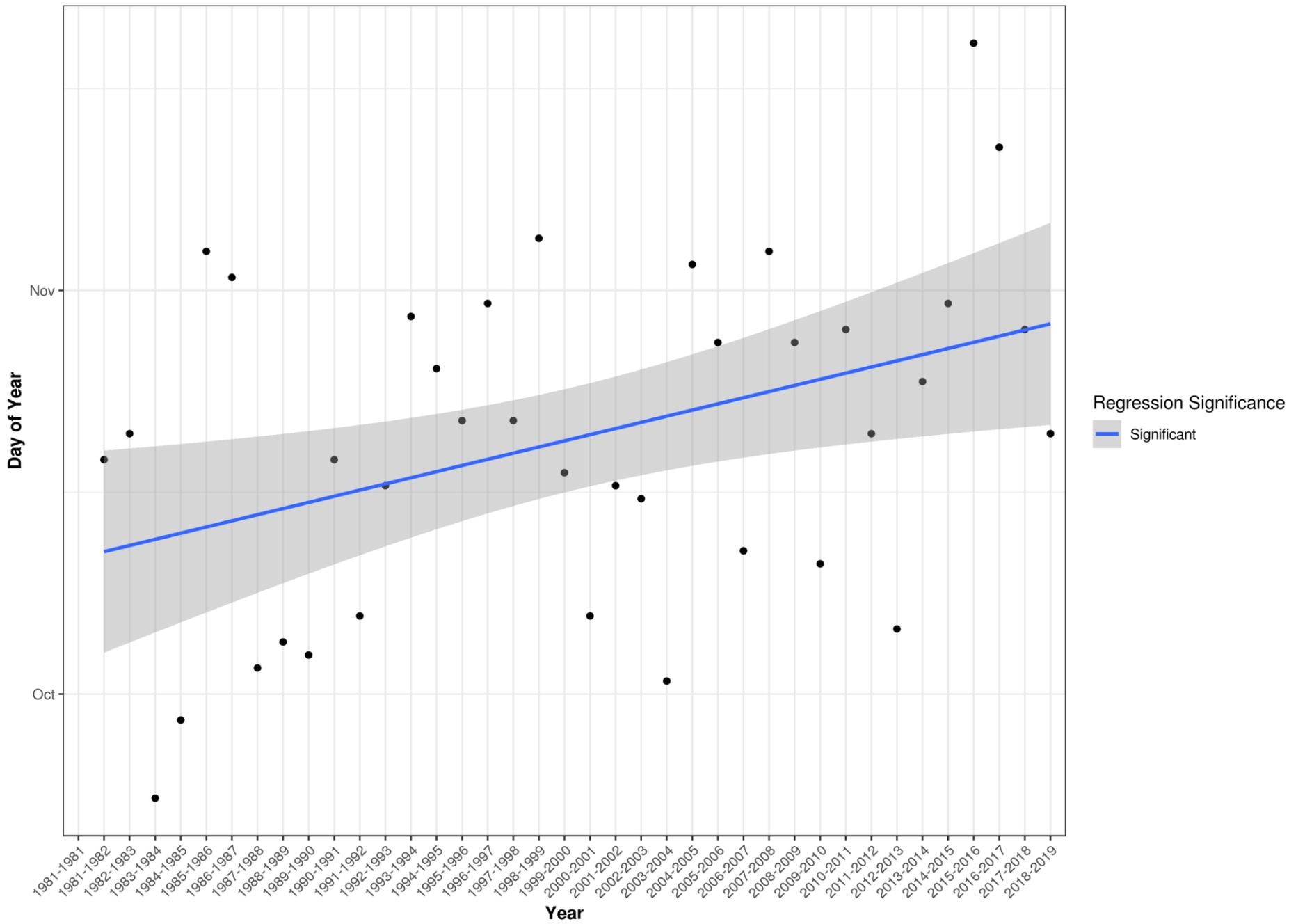


GDD Base 50/86 (degrees F); Created: 08/27/2019



# First 28F Freeze Dates

IA05



# Take Home on Frost-Freeze

- Be as patient as you can be
- Do not buy in to anything on early freeze at this point. Too early to address here. (far northern corn belt we need to start watching)
- Some corn will not make it.
- Trend is in our favor....

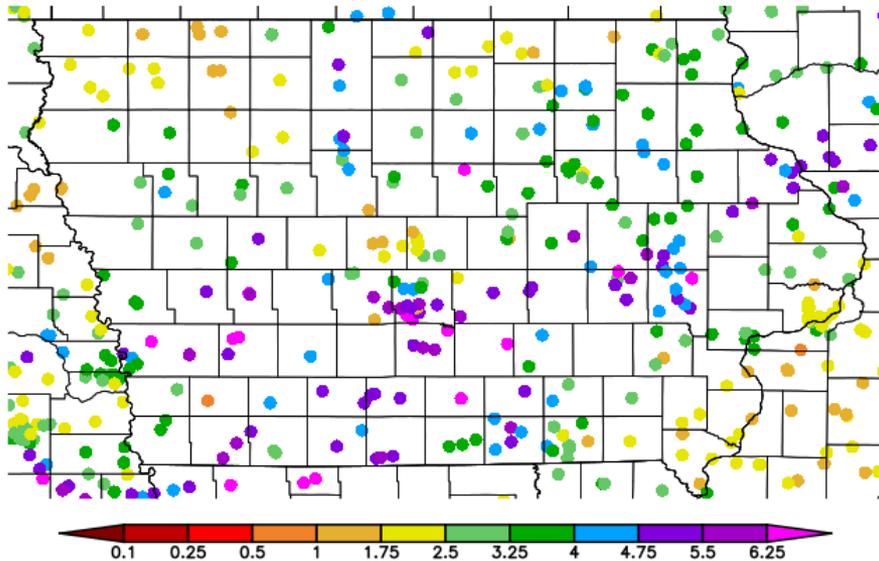
What about this season?

# **CURRENT CONDITIONS/OUTLOOKS**



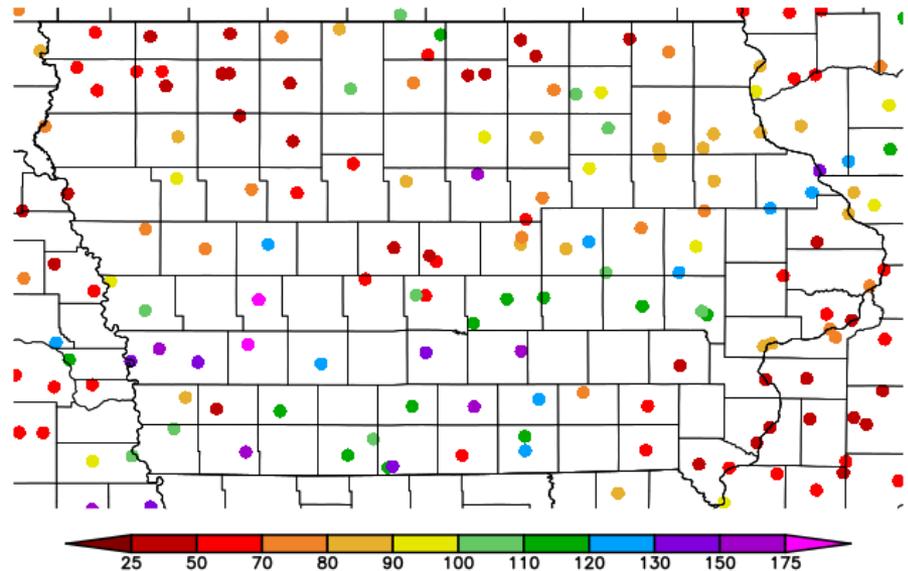
# 30 Day Precip. Total/% Avg.

Precipitation (in)  
7/26/2019 - 8/24/2019



Heaviest rain in last 30 days SW to Dubuque area 4-6" (100-150% avg.).  
Much lighter far NW and SE where less than 50% or even 25% avg.

Percent of Normal Precipitation (%)  
7/26/2019 - 8/24/2019

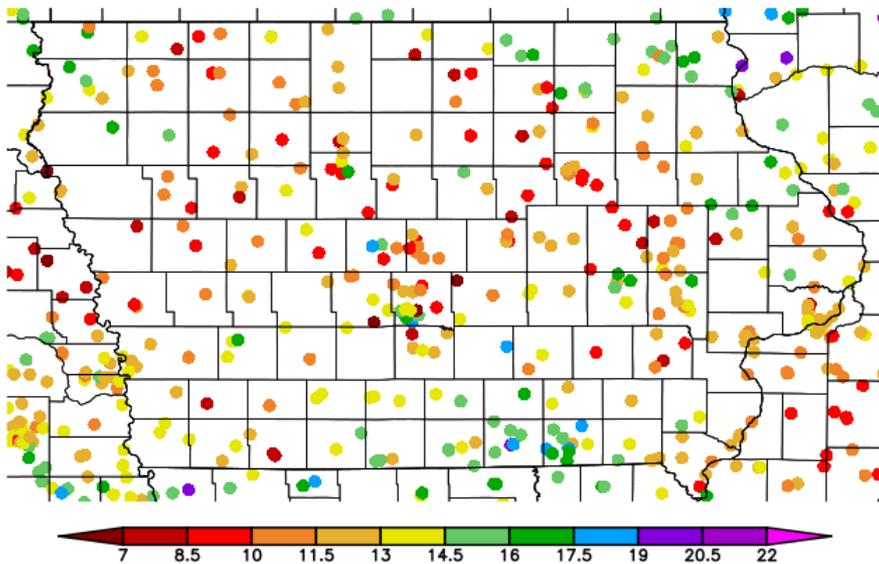


Generated 8/25/2019 at HPRCC using provisional data. NOAA Regional Climate Cent

Generated 8/25/2019 at HPRCC using provisional data. NOAA Regional Climate Centers

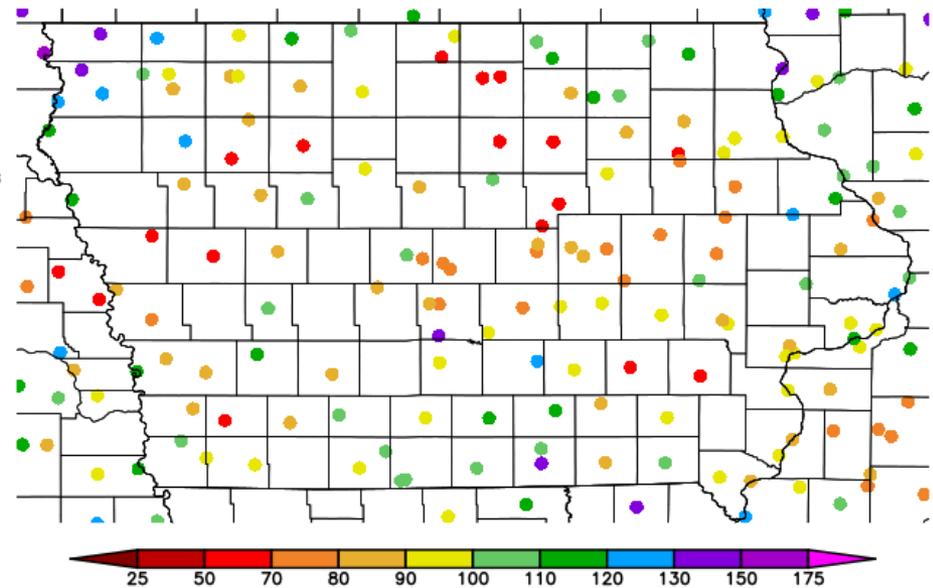
# 90 Day Precip. Total/% Avg.

Precipitation (in)  
5/27/2019 - 8/24/2019



90 day around 10-15" with heavier in the south and a few other pockets. Much of the state slightly below avg. to below 70%. Wetter than avg. in smaller pockets statewide.

Percent of Normal Precipitation (%)  
5/27/2019 - 8/24/2019

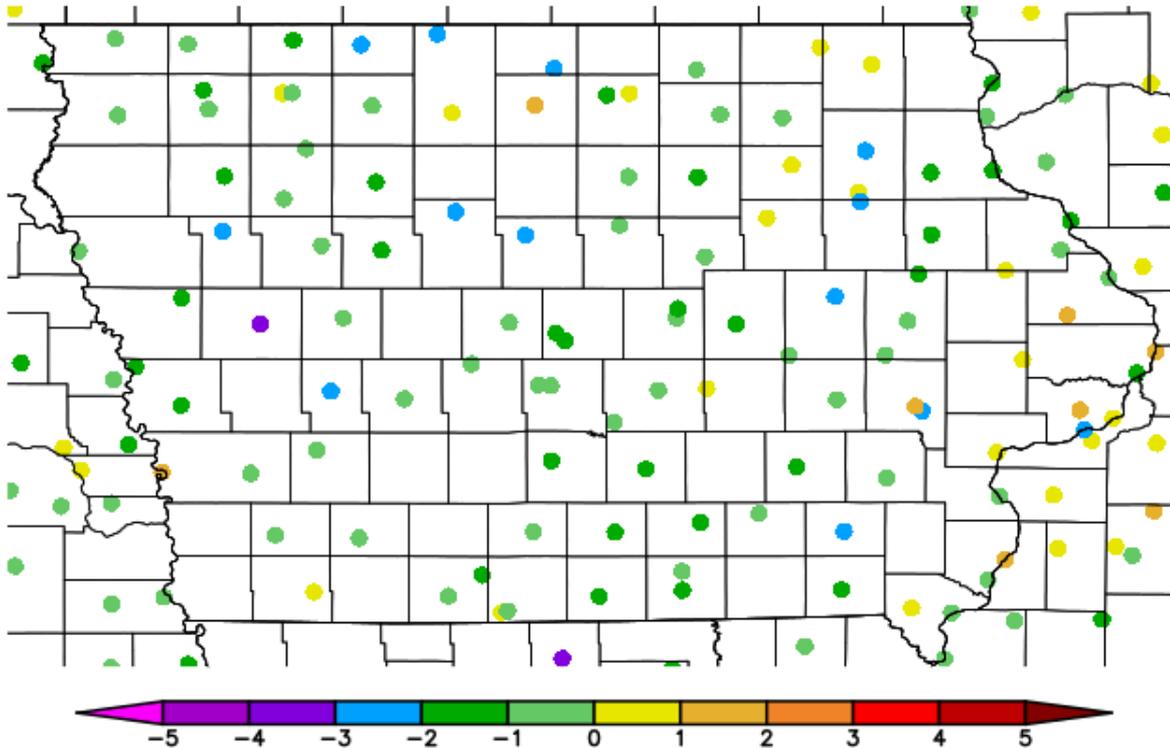


Generated 8/25/2019 at HPRCC using provisional data. NOAA Regional Climate Centers

Generated 8/25/2019 at HPRCC using provisional data. NOAA Regional Climate Centers

# 30 Day Temperatures

Departure from Normal Temperature (F)  
7/26/2019 - 8/24/2019



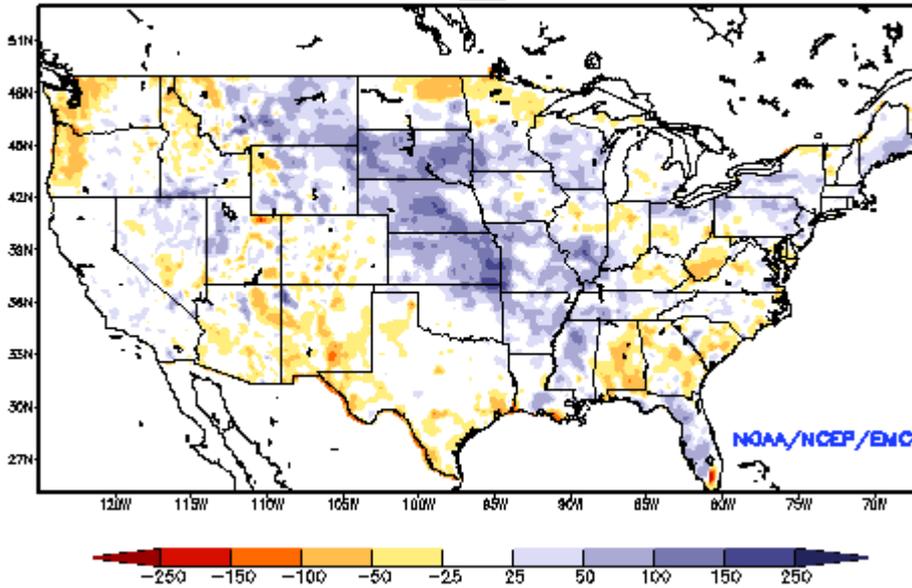
Mostly slightly cooler than average statewide last 30 days.

Generated 8/25/2019 at HPRCC using provisional data.

NOAA Regional Climate Centers

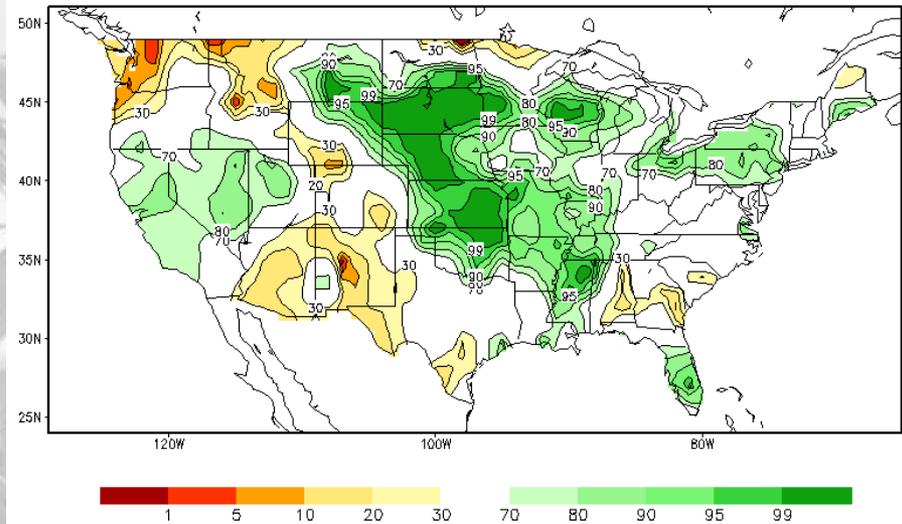
# Soil Moisture

Ensemble-Mean - Current Total Column Soil Moisture Anomaly (mm)  
NCEP NLDAS Products Valid: AUG 23, 2019



Soil moisture closer to average central IA. Wetter west – mixed to the east.

Calculated Soil Moisture Ranking Percentile  
AUG 26, 2019

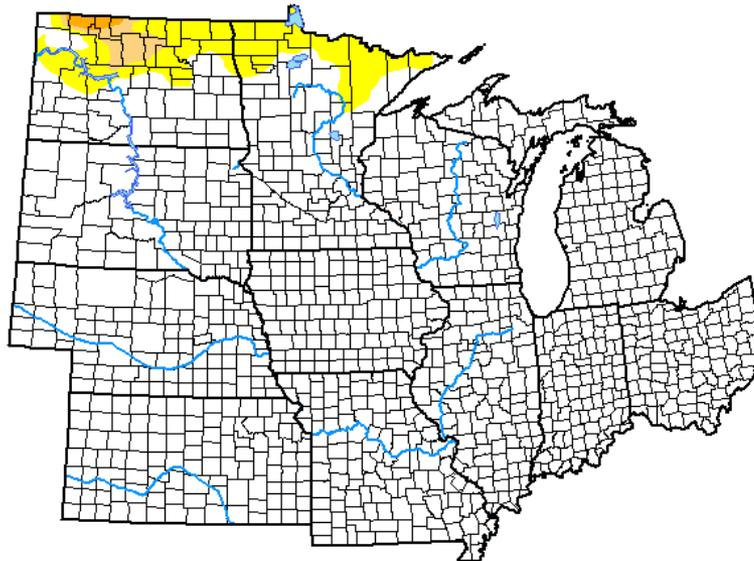


<https://www.emc.ncep.noaa.gov/mmb/nldas/drought/>

[https://www.cpc.ncep.noaa.gov/products/Soilmst\\_Monitoring/US/Soilmst/Soilmst.shtml](https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml)

# US Drought Monitor

## U.S. Drought Monitor North Central



**July 2, 2019**

(Released Wednesday, Jul. 3, 2019)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	93.80	6.20	0.99	0.22	0.00	0.00
<b>Last Week</b> 06-25-2019	94.22	5.78	1.34	0.35	0.00	0.00
<b>3 Months Ago</b> 04-02-2019	100.00	0.00	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 01-01-2019	95.93	4.07	1.43	0.00	0.00	0.00
<b>Start of Water Year</b> 09-25-2018	73.15	26.85	12.92	4.07	0.97	0.05
<b>One Year Ago</b> 07-03-2018	74.72	25.28	12.00	5.21	0.61	0.00

Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Tinker  
CPC/NOAA/NWS/NCEP

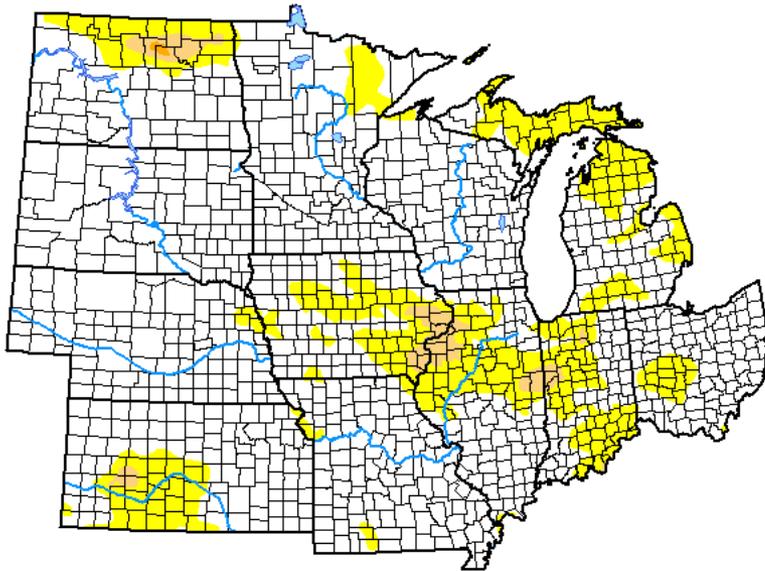


[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

D0 pockets in Minnesota.  
Northern North Dakota in D1/D2.

# US Drought Monitor

## U.S. Drought Monitor North Central



**August 20, 2019**  
(Released Thursday, Aug. 22, 2019)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	80.01	19.99	1.98	0.06	0.00	0.00
<b>Last Week</b> 08-13-2019	81.37	18.63	1.96	0.06	0.00	0.00
<b>3 Months Ago</b> 05-21-2019	96.92	3.08	0.00	0.00	0.00	0.00
<b>Start of Calendar Year</b> 01-01-2019	95.93	4.07	1.43	0.00	0.00	0.00
<b>Start of Water Year</b> 09-25-2018	73.15	26.85	12.92	4.07	0.97	0.05
<b>One Year Ago</b> 08-21-2018	55.50	44.50	20.16	7.59	2.57	0.50

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

Author:

Jessica Blunden  
NCEI/NOAA



[droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)

Precipitation deficits since early summer continue to show D1-D0 conditions. D1 Moderate drought in pockets of eastern IA.

Please share impacts of dryness with any crop.

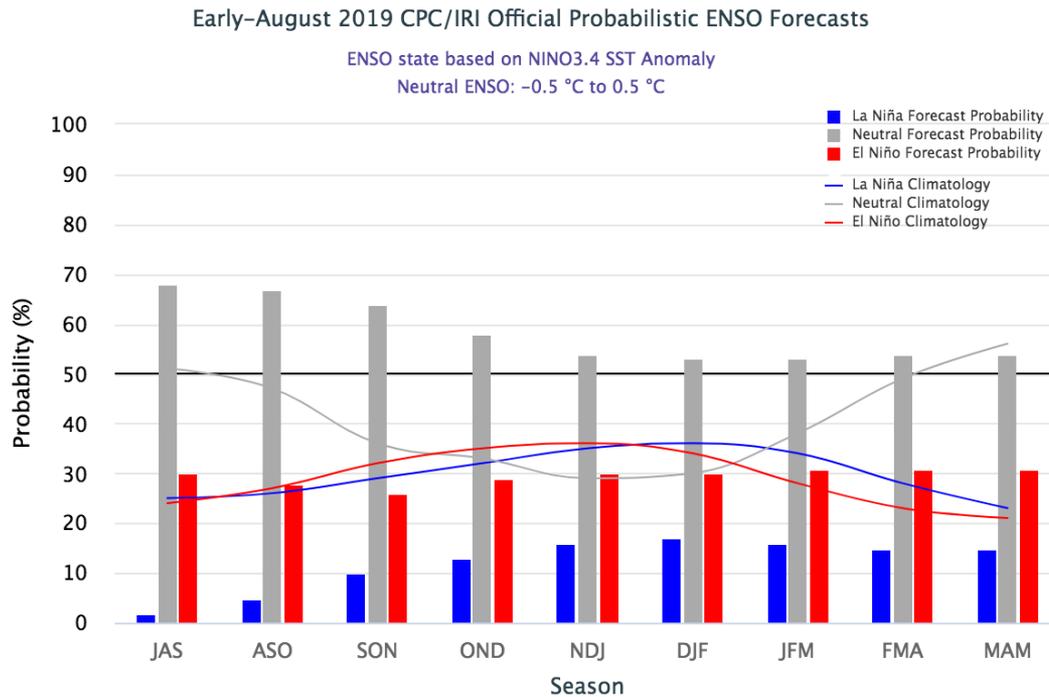
# Crop/Harvest issues

- Growing season:
  - Delayed planting/phenology
  - Slow development
  - Disease
  - Weed issues
  - Lack of sunlight (don't have good data on this)
- Harvest:
  - Freeze concerns/timing
  - More likely lots of immature high moisture corn
  - Wetness (likely less of an issue this year)
- GDD Tool - Keep checking back on progress

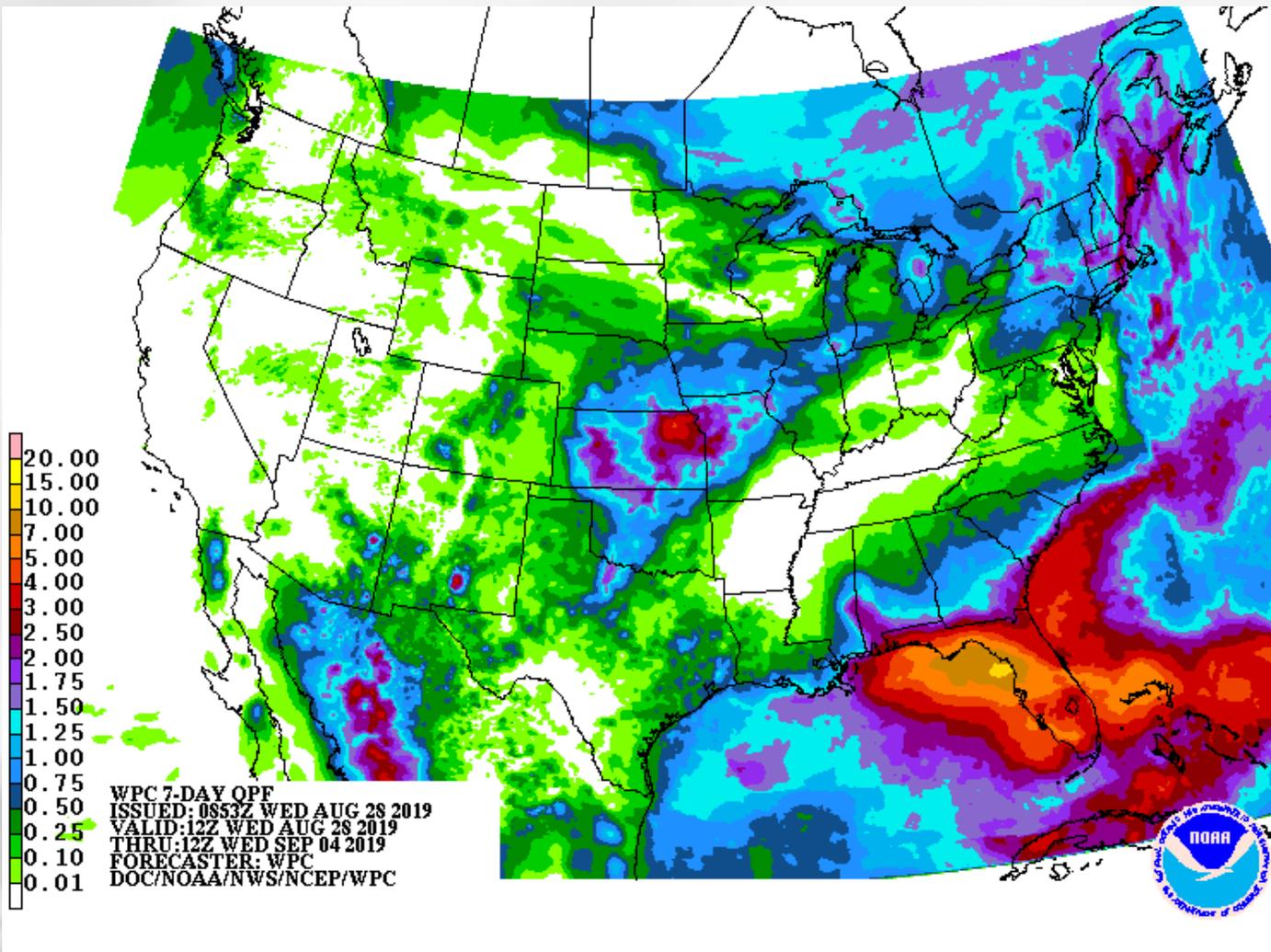
# CPC/IRI Probabilistic ENSO Outlook

Updated: 8 August 2019

ENSO-neutral is most likely to continue through the Northern Hemisphere winter 2019-20.

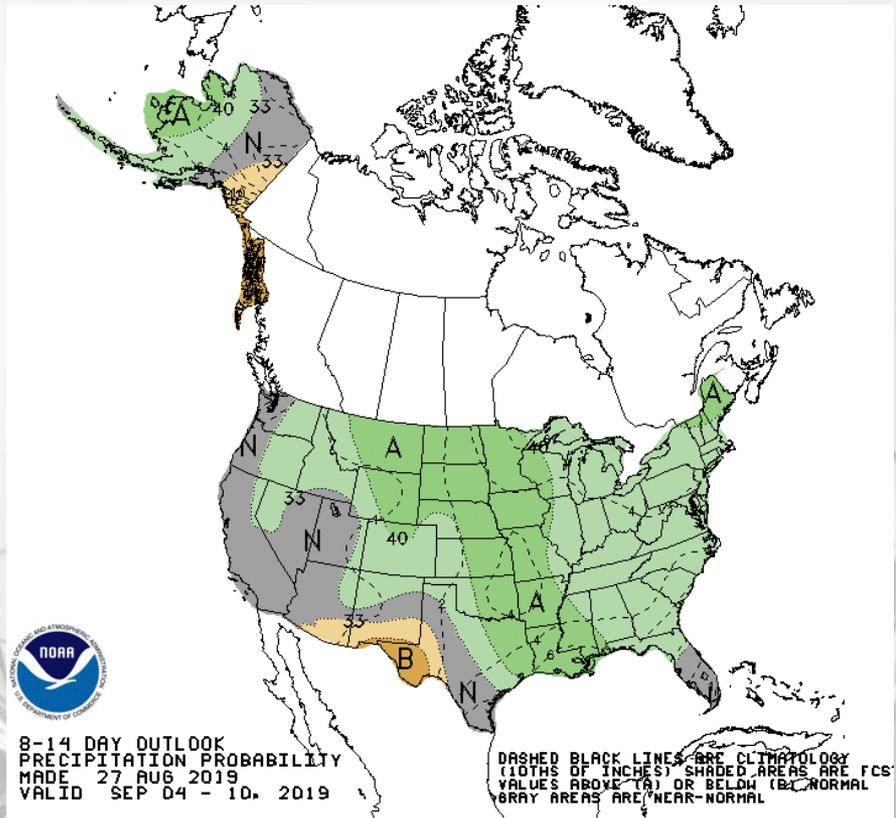
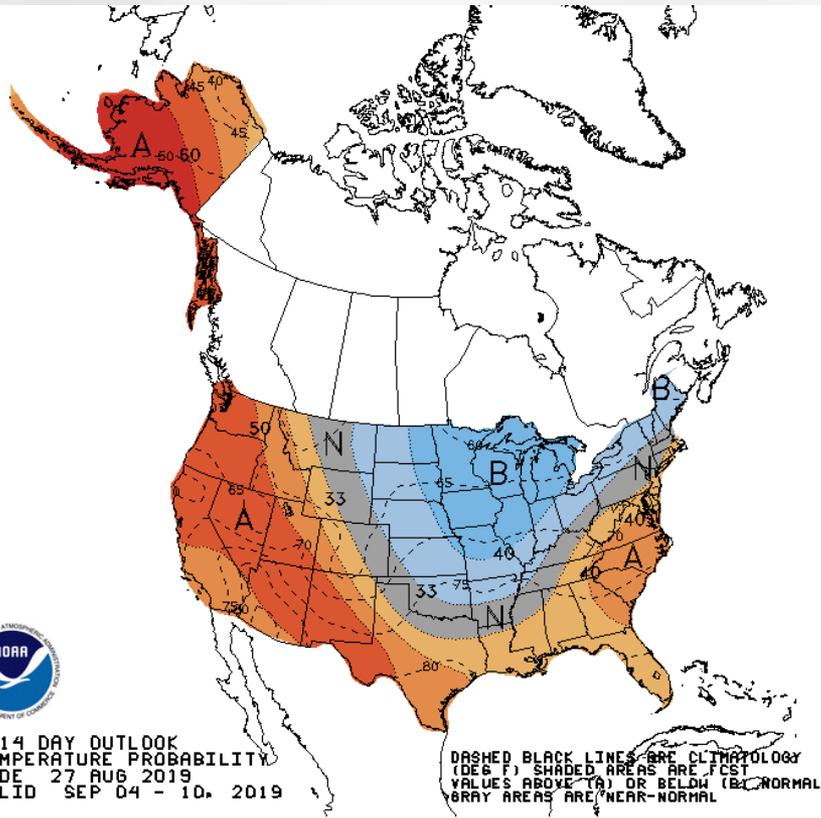


# 7 Day Forecast Precip.



Biggest rain amounts  
to our south next 7  
days.

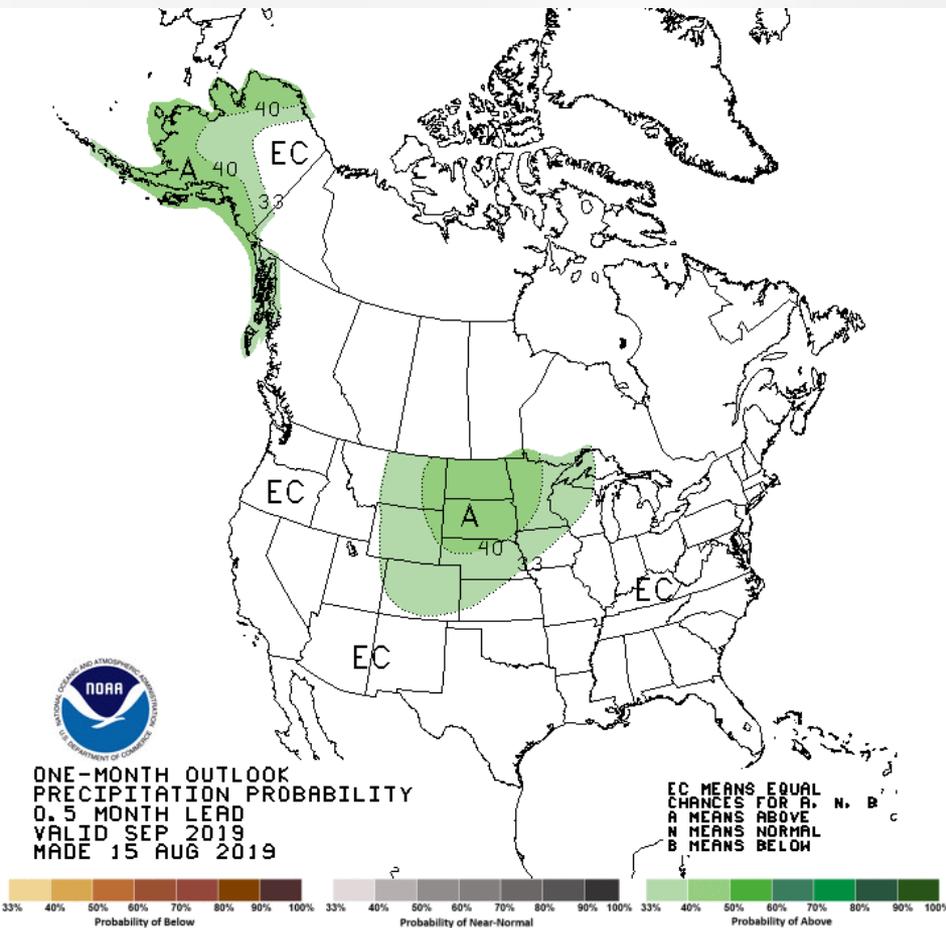
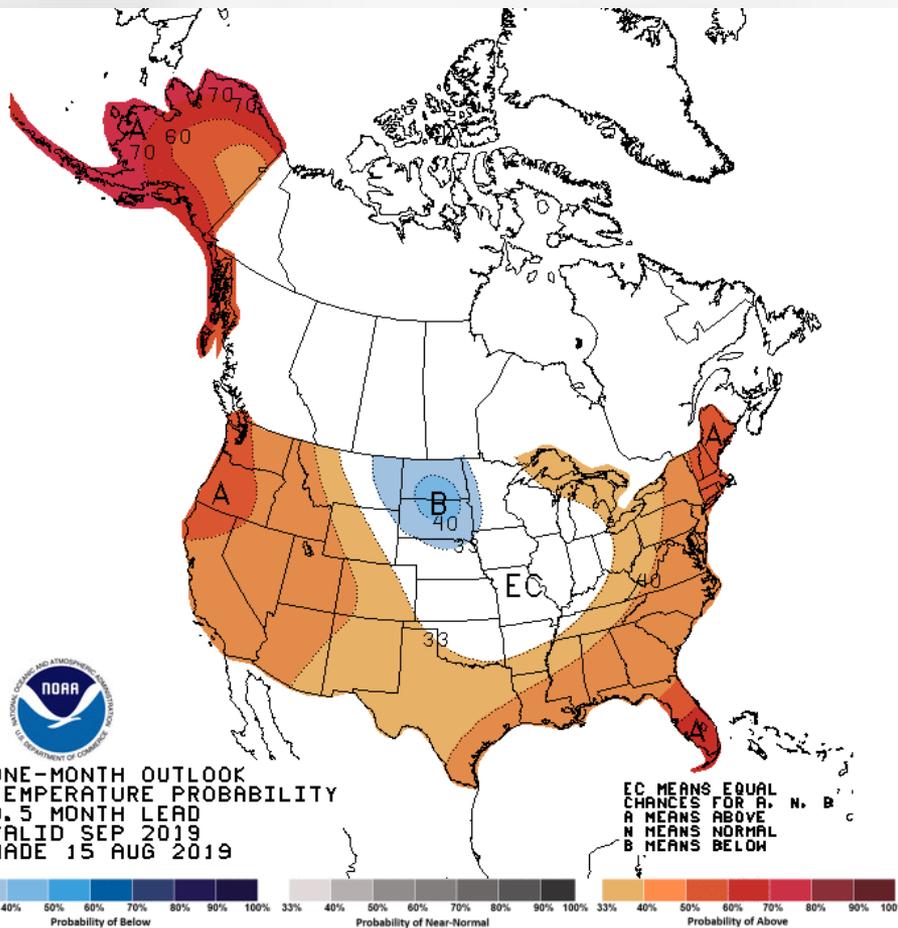
# 8-14 Day Temp and Precip. Outlook



Slightly increased chances for cooler and wetter into 2<sup>nd</sup> week of September.

<http://www.cpc.ncep.noaa.gov/>

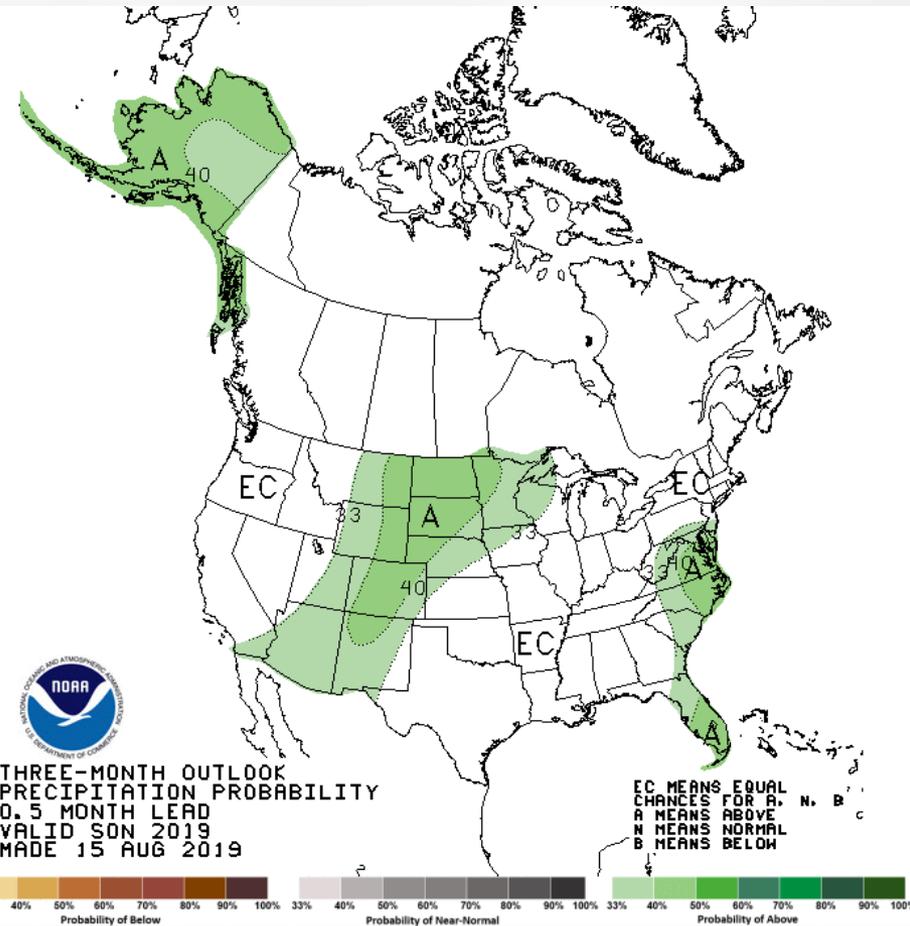
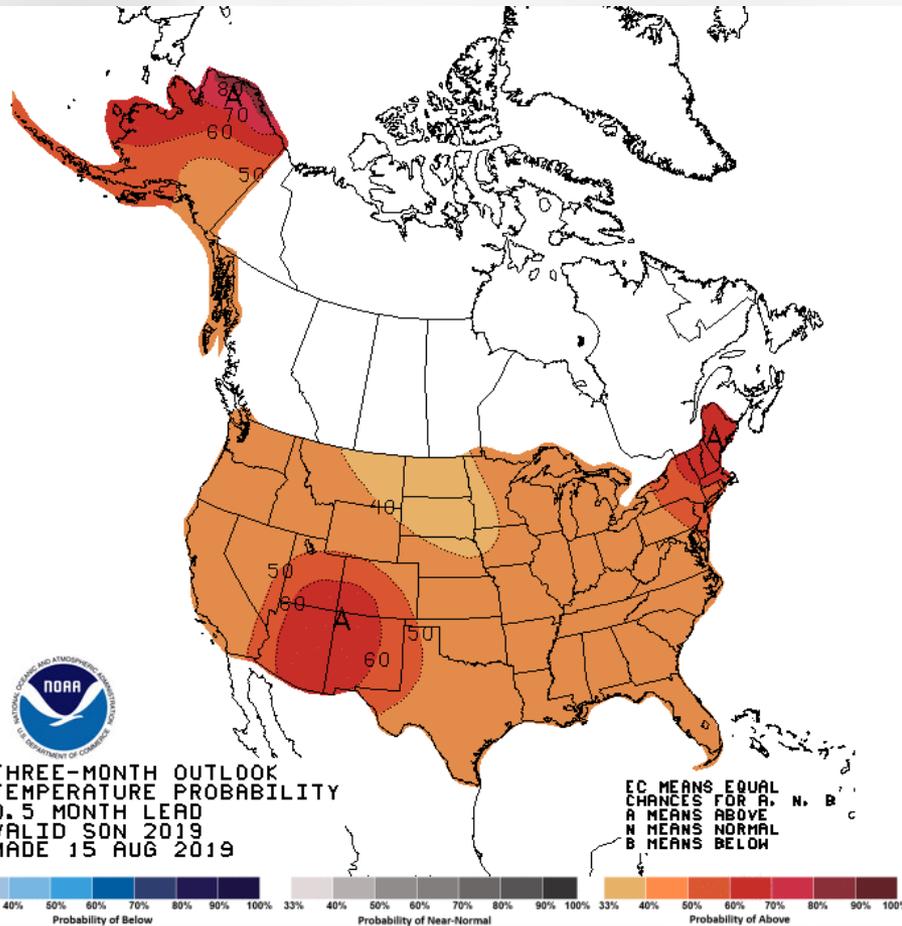
# 30 Day Temp and Precip. Outlook



Limited indications for September. Slightly higher chance on precip - NW. Almost nothing on temperature.

<http://www.cpc.ncep.noaa.gov/>

# 90 Day Temp and Precip. Outlook



<http://www.cpc.ncep.noaa.gov/>

Similar wet pattern to the 30 day in the 3 month.  
Wetter slightly more possible into the fall. Warmer  
than avg. more likely. Would be beneficial to  
hopefully lengthen season and drydown.

# Take Home

- Current conditions:
  - Drier conditions more recently (+/-)
  - Precip totals widely ranging 30 and 90 days.
  - Temperatures close to avg. last 30 days
  - Crop conditions overall still slow.
- Outlook info:
  - Some rains in the near term – probably too late to help much
  - No indications on early freeze
  - Fall outlook in our favor with warmer likely overall

# Midwest and Great Plains Climate- Drought Outlook 15 September 2016

Dr. Dennis Todey  
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Climate Hub  
Nat'l Lab. for Ag. and Env.  
Ames, IA  
dennis.todey@ars.usda.gov  
515-294-2013



United States Department of Agriculture  
Midwest Climate Hub

Sign up:

<https://www.drought.gov/drought/dews/midwest>

Archives:

<http://mrcc.isws.illinois.edu/multimedia/webinars.jsp>.



# Topics



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Hubs General Content *Climate Outlooks* has been updated.

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## Climate Outlooks



### Midwest Ag Focus Outlook

**\*\*Northeast Iowa Research Farm Growing Season Outlook June 2019**

The Midwest Ag-Focus Outlooks are produced by the Midwest Climate Hub monthly, or as needed. We utilize NOAA and USDA outlooks, placing them in context for agriculture in the Midwest based on current impacts. **The most current Midwest Ag-Focus Outlook can be found here.** For past outlooks, or if you wish to subscribe to our email list and receive outlooks as they are produced, please [email us](#).

<https://www.climatehubs.oce.usda.gov/hubs/midwest>



Midwest Climate Hub  
U.S. DEPARTMENT OF AGRICULTURE

# For More Information



Midwest Climate Hub



@dennistoday  
@usdaclimatehubs



<https://www.climatehubs.oce.usda.gov/hubs/midwest>



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**National Laboratory for Agriculture and the Environment**

Attn: Midwest Climate Hub

1015 N University Blvd

Ames, Iowa 50011-3611

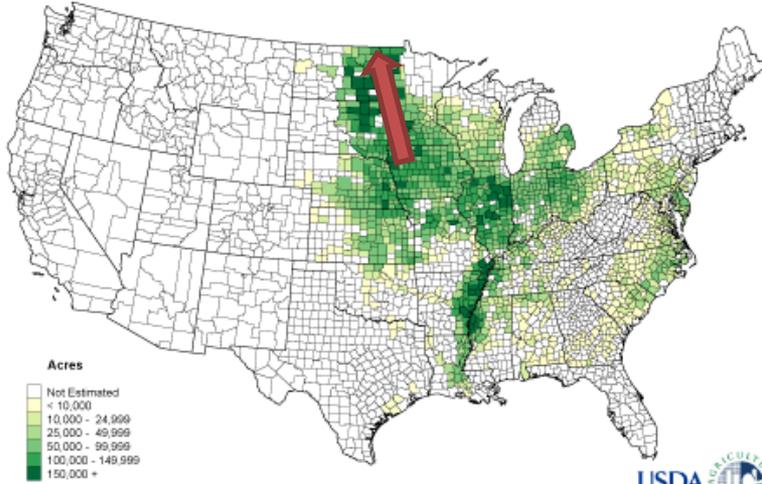


Midwest Climate Hub

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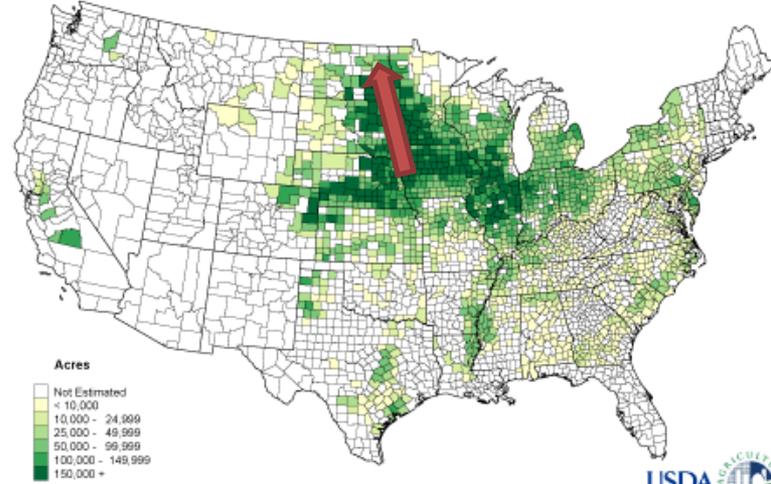
# Crop Production

**Soybeans 2013  
Planted Acres by County  
for Selected States**



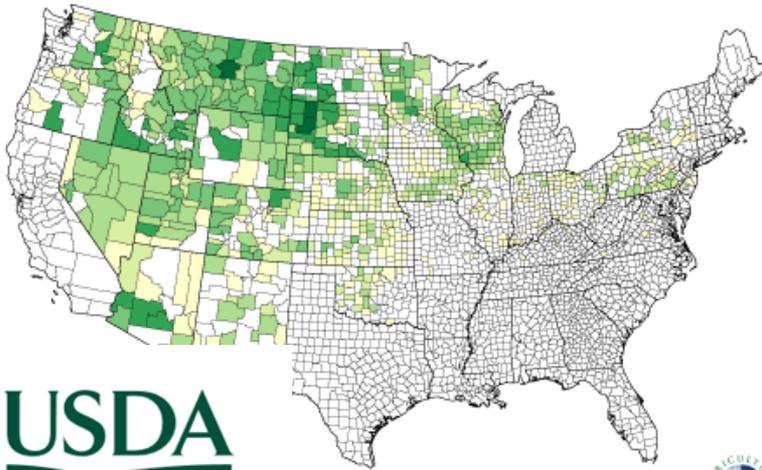
U.S. Department of Agriculture, National Agricultural Statistics Service

**Corn for All Purposes 2013  
Planted Acres by County  
for Selected States**

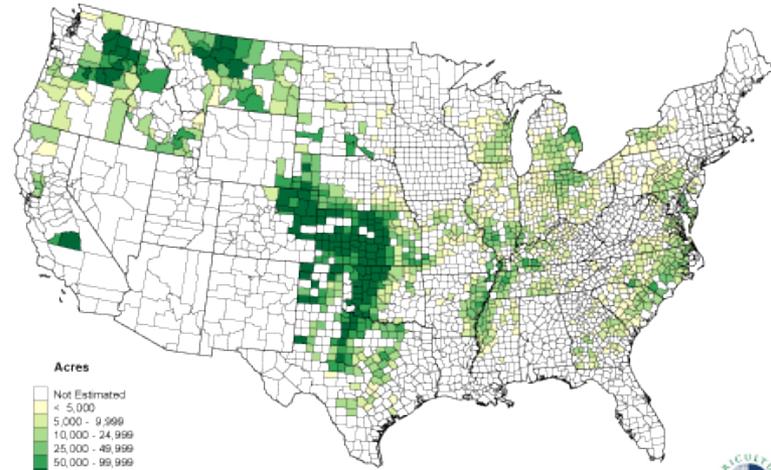


U.S. Department of Agriculture, National Agricultural Statistics Service

**Alfalfa Hay (Dry) 2013  
Harvested Acres by County  
for Selected States**



**Winter Wheat 2013  
Planted Acres by County  
for Selected States**

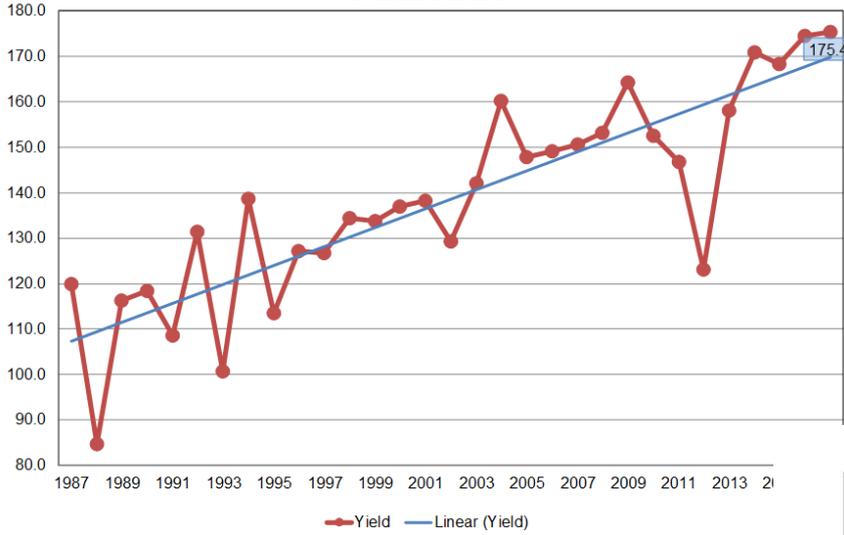


U.S. Department of Agriculture, National Agricultural Statistics Service

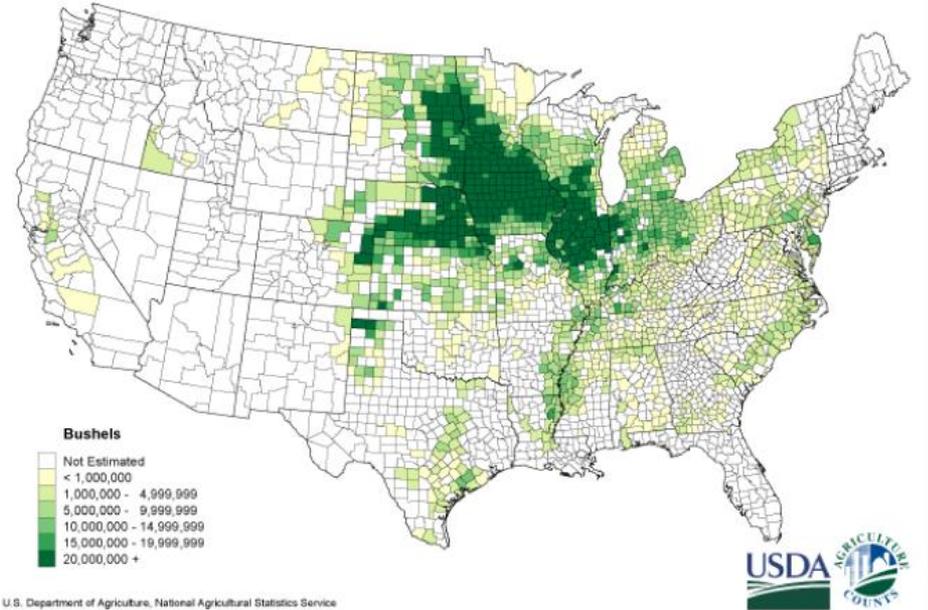


# Corn for Grain Yield United States

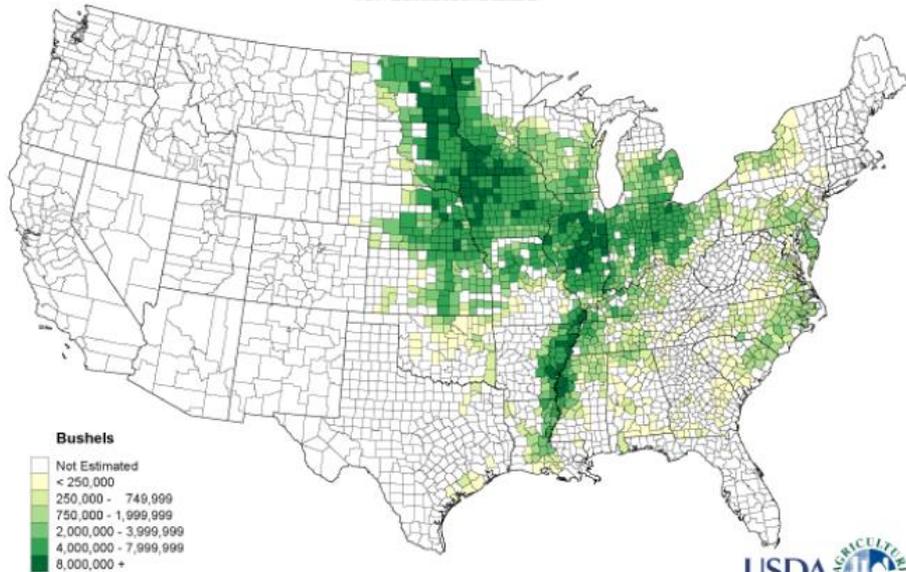
Bushels per Acre



## Corn for Grain 2016 Production by County for Selected States



### Soybeans 2016 Production by County for Selected States

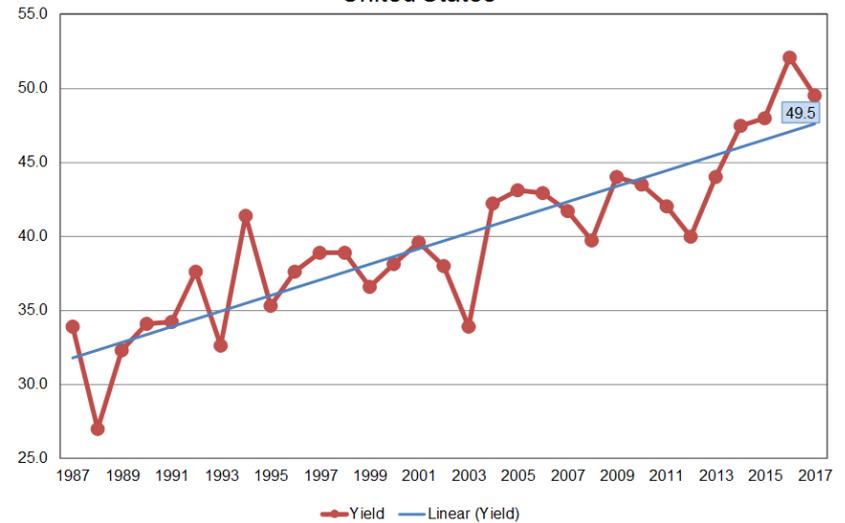


U.S. Department of Agriculture, National Agricultural Statistics Service



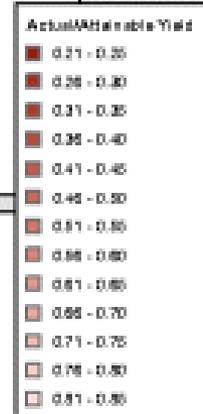
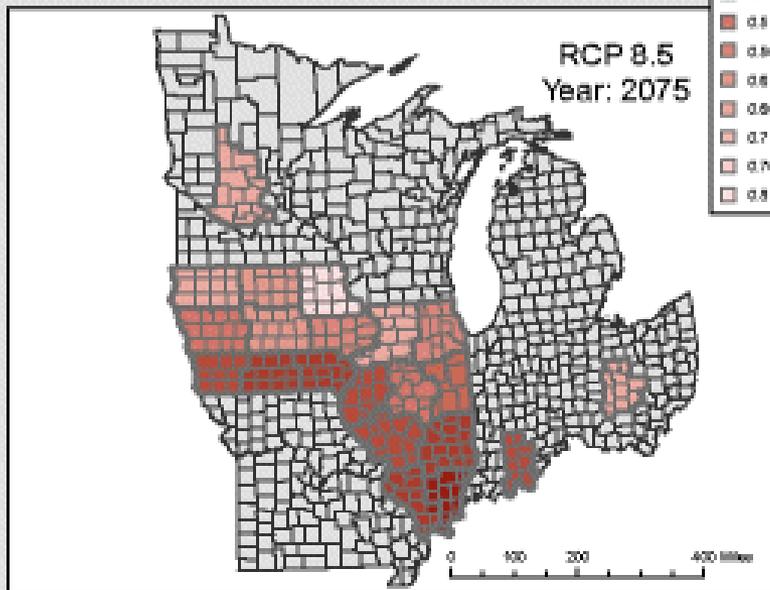
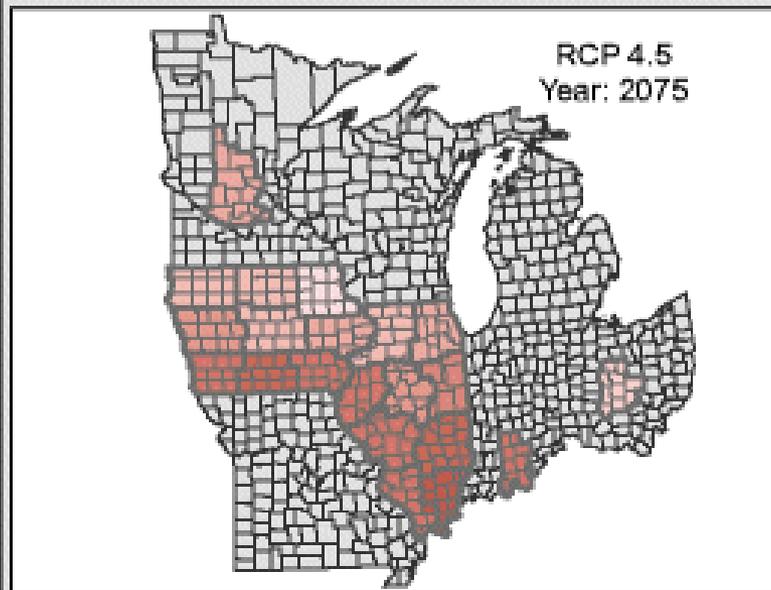
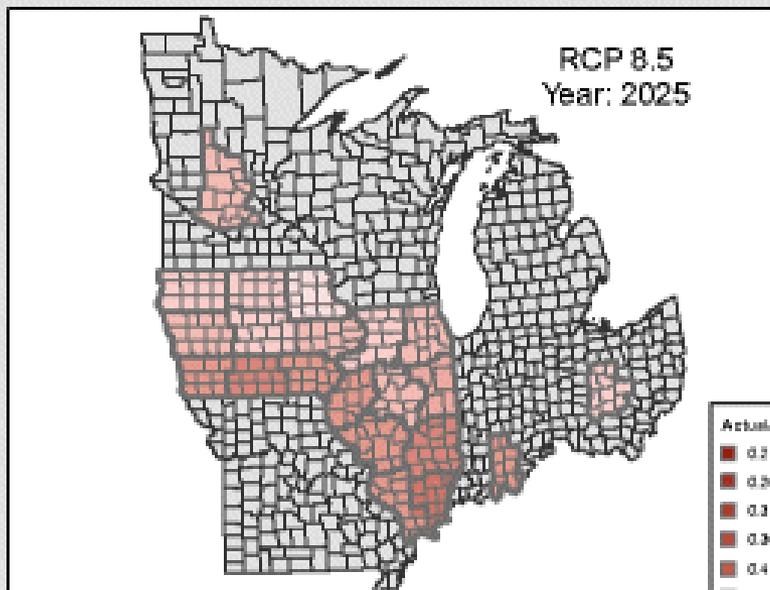
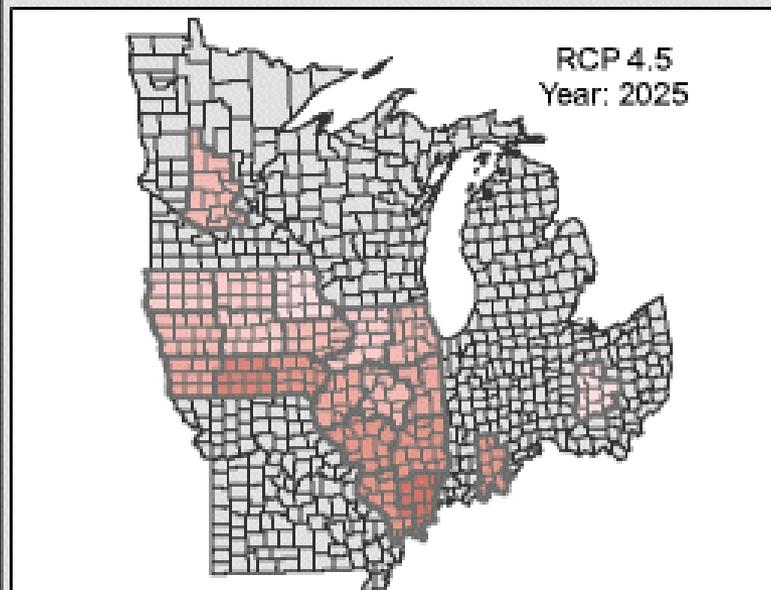
### Soybean Yield United States

Bushels per Acre





# Fraction of Actual/Attainable Yield for Midwest Maize



# Climate Change and Agricultural Pests



**1) Expanding geographic ranges northward**

**2) Reducing winter die offs**

**3) Earlier spring emergence**

**4) Increased generations per year**

- Invasive insects are of particular concern since they often limited more by climate in their non-native ranges (no natural enemies and abundant food)**

# But can CO<sub>2</sub> affect herbicide efficacy?

Ambient CO<sub>2</sub>

Future CO<sub>2</sub>



**As carbon dioxide increases, glyphosate efficacy is reduced**

Ziska et al. 1999. *Weed Science*. 47:608-615, inter alia

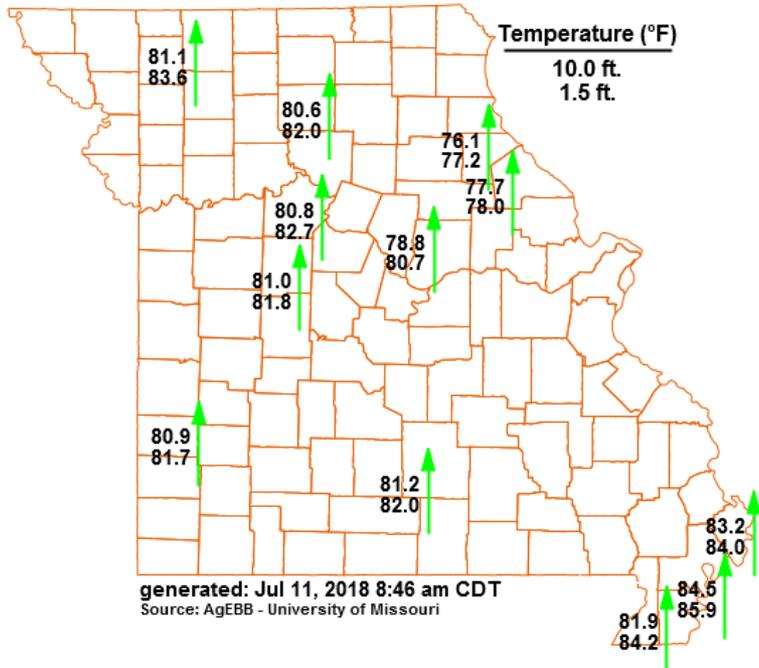
A grayscale photograph of a cornfield. The corn plants are in the foreground and middle ground, with their leaves and tassels visible. The background is a bright, hazy sky. The text 'Real data around you' is overlaid on the left side of the image.

Real data around you

**MONITORING**

# Inversions and Drift

Missouri Mesonet Real-Time Temperature at 10 and 1.5 feet

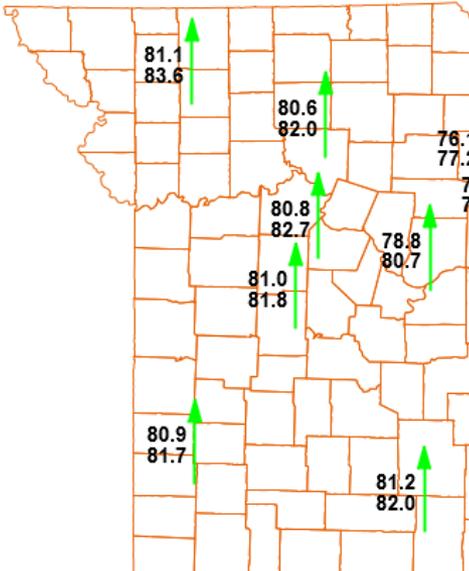


- Developing regional inversion potential for drift issues
- Missouri first
- Six additional states and Dakotas now adding
- Measuring low level inversion potential and timing

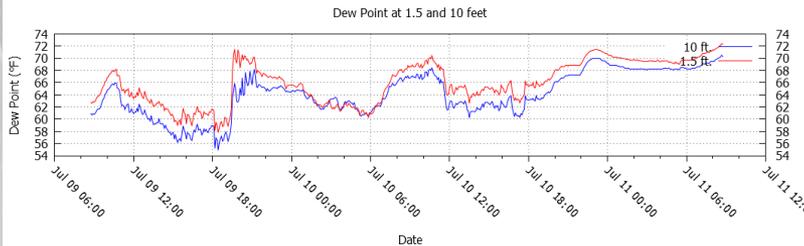
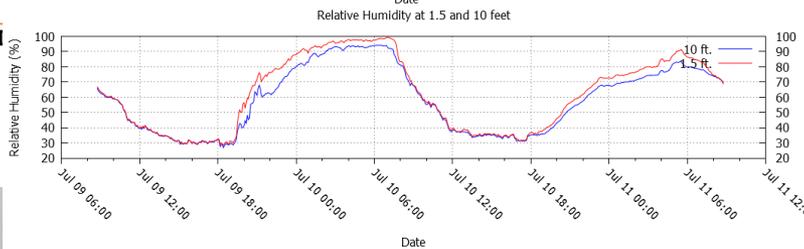
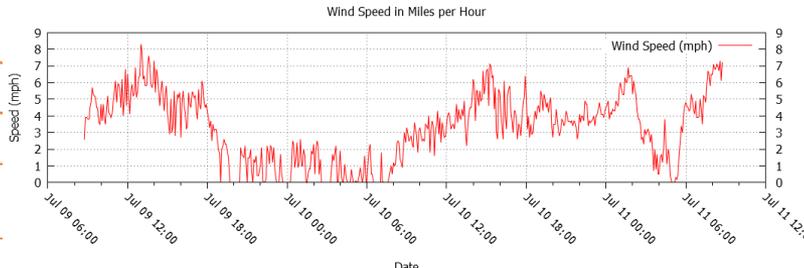
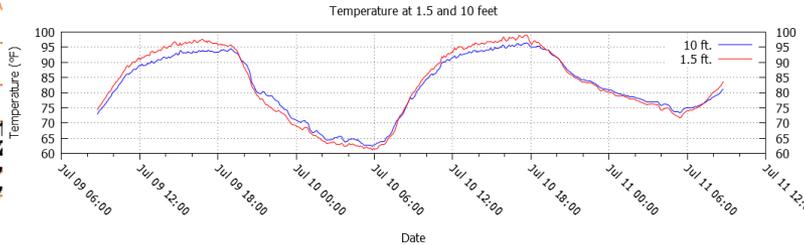
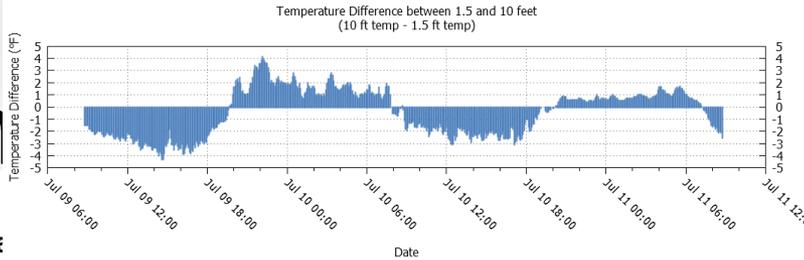
In

it

Missouri Mesonet Real-Time Tempera



generated: Jul 11, 2018 8:46 am CDT  
 Source: AgEBB - University of Missouri



g regional  
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